CONTRIBUTIONS TO THE KNOWLEDGE OF SOUTH AFRICAN MARINE MOLLUSCA. PART V. LAMELLIBRANCHIATA*

By

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(With 39 figures in the text)

Acknowledgements

Parts I, II, III, IV, and V of this work have been carried out with the aid of a research grant from the South African Council for Scientific and Industrial Research. The Council has also made a grant-in-aid towards the cost of publication of part V, as with parts II, III and IV. This help is herewith gratefully acknowledged by the Trustees of the South African Museum.

Fam. **Nuculidae**

Nucula nucleus Linn.

Nucula nucleus Linn., Sowerby, 1892, p. 66; Thiele, 1931, p. 194; Turton, 1932, p. 214.
Nucula tumidula (*non* Malm.) Thiele, 1931, p. 195.
Nucula distincta Turton, 1932, p. 214, pl. 55, no. 1489 (= juv.).

Teeth at shell length 0·75 mm. anterior 3, posterior 1–2, at 1·5 mm. 4–5 and 2–3, at 1·75 mm. 6 and 3, at 3·5 mm. 11 and 5, at 5 mm. 13–14 and 8, at 10 mm. 20 and 12, at 13–15 mm. 24–25 and 13–14 respectively.

Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); Table Bay (S. Afr. Mus.); Still Bay (S. Afr. Mus. Muir coll.); Lüderitzbucht, Agulhas Bank, and Algoa Bay (Thiele).

Off Tugela River (Natal), 65–80 fathoms; and from East London area to Algoa Bay, across Agulhas Bank to False Bay, 20–60 fathoms; south-west of Cape Point, 80 fathoms; living and dead (S. Afr. Mus. P.F. coll.).

34° 26′ S., 21° 48′ E., 37 fathoms; 33° 03′ S., 28° 11′ E., 31 fathoms; False Bay, 51 metres; Saldanha Bay; Lüderitzbucht, 35–91 metres (U.C.T.).

Distribution. Great Fish Bay, Angola (Thiele). N. Atlantic.

Remarks. Thiele identified two shells and a juvenile from the Agulhas Bank as the North Atlantic *tumidula*. According to Sars's diagnosis (1878, pp. 32, 33) there seems very little to separate this species from *nucleus*, except

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* Part I. Toxoglossa: *Ann. S. Afr. Mus.* **44** (4), 1958.
Part II. Rhachiglossa: *Ann. S. Afr. Mus.* **45** (1), 1959.
Part III. Taenioglossa: *Ann. S. Afr. Mus.* **47** (1), 1963.
Part IV. Rhipidoglossa, Docoglossa, Tectibranchiata, Polyplacophora, Solenogastres, Scaphopoda: *Ann. S. Afr. Mus.* **47** (2), 1963.

Ann. S. Afr. Mus. **47** (3), 1964, 361–593, 39 figs.

perhaps the teeth: Sars gave 10–15 'anterior', 23–25 'posterior' teeth* in *nucleus* with shell length 12 mm.; for *tumidula* 8 and 16 at shell length 6 mm. In view of the increase in number with growth, as shown by examples in the Muir and P.F. collections, this character seems of little value. The number given for *tumidula* approximates to those given above for South African *nucleus.*

According to Thiele the *Valdivia* took at one locality one shell of *tumidula* together with a pair of *nucleus.*

Without more cogent evidence I am disinclined to admit the occurrence of *tumidula* in South African waters.

The Muir series of juveniles shows that *distincta* Turton is only the juvenile of *nucleus.*

Turton's *convexa* and the juveniles nos. 1487, 1488, are almost certainly *nucleus.*

Nucula pulchra Hinds

Nucula pulchra Hinds, 1843, p. 97; 1844, p. 62, pl. 18, fig. 3; Krauss, 1852, p. 30; Thiele, 1931, p. 195.
Nucula sculpturata Sowerby, 1904, p. 7, pl. 6, fig. 11.
Nucula rugosa Odhner, 1919, p. 23, pl. 2, figs. 15–18; Dautzenberg, 1929, p. 582.

Teeth at shell length 2·5–3 mm. anterior 10, posterior 4, at 5 mm. 10–12 and 4–5, at 9 mm. 17–19 and 7–8. Hinds gave 27–29 and 9; Krauss 20–22 and 10; Odhner 22–24 and 9.

Length 9, alt. 7 mm. (Sowerby and S. Afr. Mus.); 13·5 × 10·5 mm. (Odhner).

Agulhas Bank (Hinds); 'Cape coast', coll. Zeyher (Krauss); Port Alfred (Bartsch, Turton).

33° 3′ S., 27° 57′ E., 32–34 fathoms (Sowerby, P.F. coll.).

Same locality, 5 living, cotypes; 34° 3′ S., 25° 10′ E. (St. Francis Bay), 24–34 fathoms, several valves; off Cape Natal (Durban) 47–85 fathoms, a lot, living and dead; off Umhloti River (Natal) 27–40 fathoms, 2 living, several valves; off O'Neil Peak and Cape Vidal (Zululand) 80–100 fathoms, several valves (S. Afr. Mus. P.F. coll.).

31° 38′ S., 29° 34′ E., 26 metres (U.C.T.).

Cotypes in South African Museum. Reg. no. 14830.

Distribution. Madagascar (Odhner, Dautzenberg); also in Quaternary deposits (Dautzenberg).

Remarks. Although not based on actual specimens, Thiele's suggestion that *sculpturata* is synonymous with *pulchra*, seems correct. Hinds gave the number of 'posterior' (i.e. anterior) teeth as '27–29': a misprint for 17–19? In any case re-examination of Hinds's type and actual comparison with *sculpturata* is desirable, especially because Odhner stated that the 'corselet' (escutcheon) in *pulchra* was smooth.

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* These terms must be reversed. Sars considered the shorter side anterior, but the position of the animal shows that it is actually posterior (cf. Hanley in Sowerby, 1860, *Thes. Conch.* iii, p. 147 footnote).

Odhner gave such excellent figures of his *rugosa* that the synonymy with *sculpturata* (and presumably *pulchra*) is beyond question, though the radial sculpture is not so evident. He mentioned the likeness to *pulchra* and *sculpturata*;* but the number of teeth is no objection (especially if Hinds's numbers are correct) and the difference in altitude (if any) is negligible.

The species is evidently more at home in the eastern waters of South Africa, not extending farther south-westwards than East London. The Port Alfred shells were dead, likewise the P.F. shells from St. Francis Bay. Dr. Muir did not obtain it at Still Bay; the provenance of Zeyher's shells may have been Algoa Bay (see Krauss, 1848, p. 12), but they were certainly dead shells.

Melvill (in Melvill & Standen, 1906, p. 791) compared his Persian Gulf *consentanea* with the South African *sculpturata*, 'the radiating and concentric sculpture being of the same character'. The diagnosis gave 'radiatim obscurissime striata' and the figure, pl. 54, fig. 7, shows no radial sculpture. In *sculpturata*, however, both the concentric and radial sculpture are much stronger (see Sowerby's figure).

Nucula irregularis Sow.

Nucula irregularis Sowerby, 1904, p. 7, pl. 6, fig. 12.

The oblique ridges on juvenile and immature shells are cut off obliquely at the antero-ventral margin. The whole lunule, not only its rim, is crossed by ridges. The sculpturing is quite distinct from that of *pulchra*.

Teeth at shell length 3·5 mm. anterior 10, posterior 4, at 6 mm. 17–19(20) and 7(8).

Off Struys Point, 48–49 fathoms (Sowerby, P.F. coll.).

Same locality, 2 living, cotypes; off Amatikulu River (Zululand) 24 fathoms, one valve; off Tugela River (Natal) 37 fathoms, 19 valves; off Umhloti River (Natal) 40 fathoms, 13 valves (S. Afr. Mus. P.F. coll.).

Cotypes in South African Museum. Reg. no. 14834.

Remarks. The type locality is open to doubt. The original label with the *Pieter Faure* number is not extant. The label returned with the two cotypes bears in Sowerby's writing the *Pieter Faure* number 15319, for which Struys Point (approx. 20° 15′ E.) is the correct locality. Nevertheless, the occurrence of dead valves off the Zululand–Natal coast suggests a possible error in labelling: 12319 would indicate a Natal locality, and 13319 or 13519 a locality in the Cape Morgan–East London area. Living shells in the Zululand–Natal–East London area and dead shells farther west is in conformity with the direction of the coastal current, but not vice versa. Probably the original number was 13519.

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* He erroneously gave Reeve as the author of *pulchra*; and *sculpta* 1908 instead of *sculpturata* 1904. 1908 is the date of the title-page of vol. 4 of the *Marine Investigations in S. Africa*, not the date of Sowerby's paper in that volume.

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Nucula sultana Thiele

Fig. 1 *b*

Nucula sultana Thiele, 1931, p. 197, pl. 7(2), figs. 41, 41*a*.

Length greater than altitude, posterior margin convex. Middle part smooth, with only growth-lines, but some radial striae show very faintly near the ventral margin. Anterior and posterior parts with strong, concentric, curved ridges, cutting obliquely across the growth-lines, *c.* 30 on anterior, *c.* 20 on posterior part. Lunule not distinct. Teeth anterior 17–18, posterior 8; ligament pit oblique; margin internally crenulate.

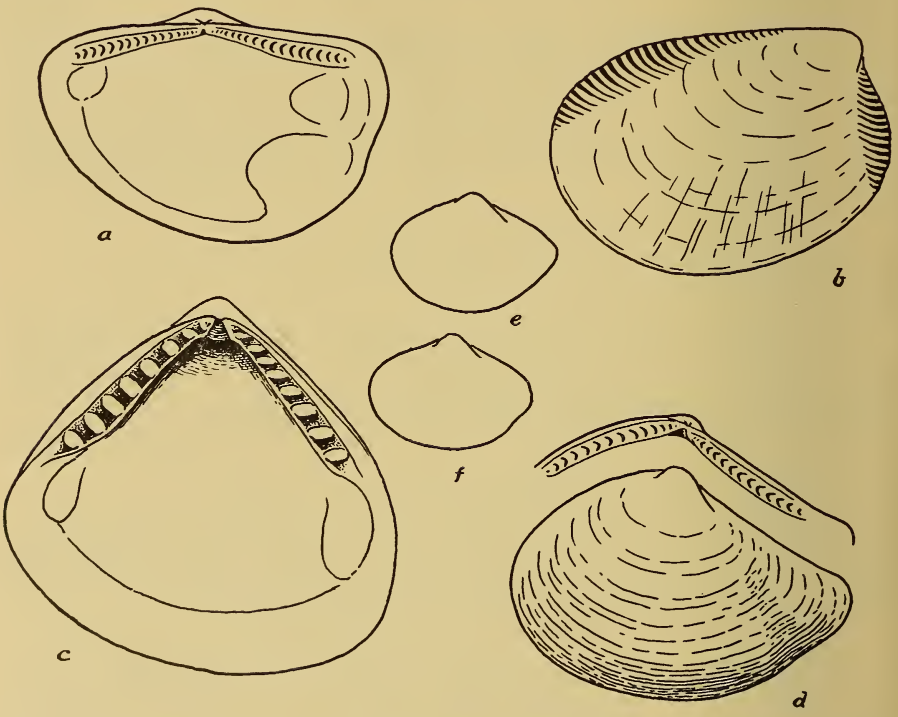


Fig. 1. *a. Leda compta* (Sow.), internal view of right valve of cotype. *b. Nucula sultana* Thiele. *c. N. aequalitas* n.sp. *d. Leda spreta* Thiele, 8 mm. long. *e.* juvenile, 2 mm. long. *f.* copy of Thiele's fig. 52, 3–4 mm. long.

Length 10·5, alt. 8 mm. (S. Afr. Mus.); 17 × 15 mm. (Thiele).

Delagoa Bay, one living, dredged in muddy channel, harbour entrance (S. Afr. Mus., K.H.B. coll., 1912); Durban harbour sediments (Dr. Lester King, 1963).

Distribution. East Africa: 5° 55′ S., 39° 1′ E., 50 metres (Thiele).

Remarks. The *Valdivia* shell is larger and has 25 anterior and 10 posterior teeth.

Nucula aequalitas n.sp.

Fig. 1 *c*

Solid, subtriangular, almost equilateral, upper anterior and posterior margins converging to a right angle, ventral margin gently convex. Fine concentric growth-lines only. Teeth 8 on each side of the ligament pit. Margin internally smooth. Glossy, pale brown. Length 3·75, alt. 3·5, width (valves together) 2·2 mm.

Off East London, 400–450 fathoms, one living (S. Afr. Mus. A9472, P.F. coll.).

Remarks. Comparable with *guineensis* Thiele (1931, p. 193, pl. 7(2), figs. 35, 35*a*), from the Gulf of Guinea to the mouth of the Congo River, 44, 2278 and 2492 metres; and with *verrillii* Dall, 1889 (see references quoted in Thiele), from the east coast of North America.

Differs in being slightly longer than high, and in having fewer teeth, equally disposed on each side of the ligament pit. The specific name refers to this symmetry of the teeth, and the nearly equilateral outline.

Distinguished from the other South African species by its shape, though *Nucula benguelana* Clarke approaches it in this respect (see Barnard, 1963b, p. 446).

Fam. **Ledidae**

Leda belcheri (Hinds)

Nucula belcheri Hinds, 1843, p. 98; 1844, p. 63, pl. 18, fig. 11.
Nuculana belcheri Sowerby, 1904, p. 4, pl. 6, fig. 7.
Leda belcheri (Hinds), Thiele, 1931, p. 202.

The ridges on the middle part develop only at about shell length 10 mm., and are slightly oblique to the concentric growth-lines; they do not extend on to the posterior dorsal side between the lower oblique rib and the hinge-line, which is crossed only by fine close-set growth-lines. Teeth at shell length 3 mm. anterior 9, posterior 7, at 4 mm. 10 and 8, at 6 mm. 12 and 10, at 10 mm. 18 and 15, at 20 mm. 22 and 20, at 37 mm. 28–30 and 25–26, with 1–3 minute ones on each side of the ligament pit. Periostracum thin, pale brown, around both ends and along ventral margin, but usually abraded on middle part of shell. Up to length 38 mm., alt. 18 mm.

Agulhas Bank, 40–54 fathoms (Hinds).

False Bay, 34 and 42 fathoms; off Cape St. Francis, 75 fathoms; Algoa Bay, 256 fathoms (Sowerby, P.F. coll.).

Agulhas Bank, 80–102 metres; Simon's Bay (False Bay), 70 metres, 2 living (Thiele).

Living: from Cove Rock and Nieca River (East London area) to Algoa Bay, across Agulhas Bank to False Bay, 30–100 fathoms; one living shell and several valves were also taken at 34° 27′ S., 25° 42′ E. (south of Cape Recife), 256 fathoms (S. Afr. Mus., P.F. coll.).

Living: False Bay; 34° 33′ S., 21° 28′ E., 67 metres; 34° 33′ S., 21° 52′E., 42 fathoms; and 34° 35′ S., 21° 11′ E., 75 metres (U.C.T.).

Remarks. This is a characteristic and abundant species throughout the above-mentioned area, but does not extend farther north-eastwards than the neighbourhood of East London, not even as far as Cape Morgan. It lives in False Bay, but does not extend around Cape Point on to the west coast. The most westerly localities where the *Pieter Faure* obtained dead shells are: Cape Point, N. ½ E., 4 miles, 50 fathoms, and Cape Point, N.E. ½ N., 19 miles, 145 fathoms.

The locality off Cape Natal given by Sowerby is erroneous, due to a slip on Sowerby's part; the specimen returned with his label is clearly *lamellata*.

The anterior teeth are consistently slightly more numerous than the posterior teeth.

Leda lamellata (Sow.)

Nuculana lamellata Sowerby, 1904, p. 5, pl. 6, fig. 8.

Ridges developing much earlier than in *belcheri*, slightly oblique to the concentric growth-lines; and continued on to the dorsal posterior end, where they become lamellate; they cross the 2 grooves between the 3 ribs. Teeth at shell length 3 mm., anterior 9, posterior 9 at 4–5 mm. 12 and 12, at 7 mm. 14–15 and 15–16, at 10 mm. 15–16 and 17–18, at 14 mm. 17–18 and 21–22 at 17 mm. 20–21 and 22–23, at 20 mm. 24–25 and 28–29, with 1–2 minute ones on each side of the ligament pit. Length 21, alt. 10·5 mm. Periostracum thin, pale brown, on hind end and along ventral margin.

Off Cape Natal (Durban), 54 and 85 fathoms (Sowerby, P.F. coll.).

From the same locality a lot, living and odd valves, cotypes; same locality 47 and 62 fathoms; off O'Neil Peak (Zululand), 55 fathoms, 6 living; off Cape Natal, 250 fathoms, one living, and 440 fathoms, one living; off Hood Point (East London), 49 fathoms, odd valves (S. Afr. Mus. P.F. coll.).

Remarks. Abundant in the Durban area, but no examples were taken farther south except the dead valves off Hood Point. The specimen from 440 fathoms is that previously recorded by Sowerby inadvertently as *belcheri*.

Leda gemmulata (Sow.)

Nuculana gemmulata Sowerby, 1904, p. 6, pl. 6, fig. 9.

Ridges as in *lamellata* developing early; at posterior end they become lamellate, and squamose on the 4 ribs; they do not cross the intervening grooves between the ribs (occasionally some of the growth-lines are lamellate). Teeth at shell length 15 mm. anterior and posterior 20–21, at 21 mm. 23–25. Length 22, alt. 11 mm. Periostracum thin, pale brown, on posterior end and along ventral margin.

Off Tugela River (Natal), 37 fathoms; off Umvoti River (Natal), 27 fathoms (Sowerby, P.F. coll.).

Off Tugela River, 37 fathoms, 2 living, cotypes; off Amatikulu River (Zululand), 24 fathoms, 12 living; off O'Neil Peak (Zululand), 90 fathoms, 3 living and odd valves; off Durnford Point (Zululand), 90 fathoms, 3 valves; off Morewood Cove (Natal), 27 fathoms, 4 living and several valves; off Umvoti River (Natal), 27 fathoms, 3 living; off Umhloti River (Natal), 27 fathoms, 3 living and several valves; off Cape Natal (Durban), 47 fathoms, one living (S. Afr. Mus. P.F. coll.).

29° 46′ S., 31° 17′ E., 60–70 fathoms (U.C.T.).

Remarks. Neither living shells nor dead valves of this species have been found farther south than off Durban.

Leda compta (Sow.)

Fig. 1 *a*

Nuculana compta Sowerby, 1904, p. 6, pl. 6, fig. 10.

The number of teeth (not mentioned in the description, but indicated in the small figure) is, in the cotype, 8·5 mm. shell length, 14 anterior, 17 posterior, with 2–3 minute ones on each side of the very small ligament pit; at 6 mm. shell length 10–11 anterior, 13–14 posterior.

The cotype contained the animal, which however, after over 55 years preservation in a dry state, was not in very good condition. There is a definite pallial sinus, and the siphons appear to be completely united. The animals in the two bottom-sample shells were less well preserved.

Off Cape Natal (Durban), 440 fathoms, 2 specimens (Sowerby, P.F. coll.)

Bottom-sample from same haul, 2 living, 2 valves (S. Afr. Mus. P.F. coll.)

Remarks. The unopened specimen which contained the animal was returned by Sowerby and is regarded as the cotype (S. Afr. Mus. Reg. no. 14818). The specimen figured, showing the hinge teeth (Type) is presumably in the Sowerby collection in the British Museum.

Two juveniles from off Cape Point, 700 fathoms, which at the time without close study I thought might be this species, were went to Tomlin; they were not returned and are presumably in the Tomlin collection in the National Museum, Cardiff.

Leda sinuata Thiele

Leda sinuata Thiele, 1931, p. 203, pl. 7(2), figs. 53, 53*a*.

A single right valve agrees with Thiele's description and figure, except that the teeth number anterior 12, posterior 16, with 4 minute ones on each side of the ligament pit; but the specimen is slightly larger than Thiele's shells. The concentric ridges are weaker anteriorly. Length 8·5, alt. 5·25 mm.

Off East London, 400–450 fathoms, one valve (S. Afr. Mus. Reg. no. A9452 P.F. coll.).

Distribution. Zanzibar Channel, 463 metres (Thiele).

Remarks. Thiele noted the close similarity to the European Tertiary fossil *excisa* (Phil.). Examples of the latter living in the North Atlantic, with a shallower posterior sinus, have been named *subexcisa* by Dautzenberg & Fischer (1897, 1927).

Although Atlantic species have been obtained from the deep water off East London, e.g. *Eudolium crosseanum* (Mont.) (Barnard, 1963a, p. 8), the present shell is preferably assigned to the East African species.

Leda spreta Thiele

Fig. 1 *d*, *e*, *f*

Leda spreta Thiele, 1931, p. 203, pl. 7(2), figs. 52, 52*a*.

Teeth 10–12 both anteriorly and posteriorly, with 3–4 minute ones on each side of the ligament pit. Length 9, alt. 6·5 mm. A larger shell with broken umbo has length 10 mm.

35° 19′ S., 20° 12′ E., 126 metres (Thiele).

St. Francis Bay, 24–34 fathoms, 14 valves; off Hood Point (East London), 49 fathoms, 5 valves, 3 juv. living; off Cape Natal (Durban), 54 fathoms, 2 valves, and 85 fathoms, several valves; off Umhloti River (Natal), 40 fathoms, 7 valves; off Umvoti River (Natal) 56 fathoms, 11 valves; off Tugela River (Natal), 65–80 fathoms, 2 valves; off Durnford Point (Zululand), 90 fathoms, 7 valves; off Cape Vidal (Zululand), 80-100 fathoms, 9 valves (S. Afr. Mus. P.F. coll.).

Remarks. The present specimens are much larger than the *Valdivia* shells, but leave little doubt as to their identity. The most obvious difference is in the posterior end; but when a juvenile 2–3 mm. long is compared with Thiele's figure of a 3·4 mm. shell there is very little difference.

Clarke (1961, p. 375) has recorded *Nuculana ultima* Smith, 1885 from *Vema* stations 51 and 52 (45° 34′ S., 6° 2′ E., 2507 fathoms, and 41° 3′ S., 6° 2′ E., 2711 fathoms) approximately 1,000 and 800 miles respectively south-west of Cape Town. He regarded *modesta* Thiele, 1931, from 2,278 metres in the Gulf of Guinea, and *spreta* Thiele, 1931, from 126 metres on the Agulhas Bank, as synonyms of *ultima*. He may be right in uniting *modesta* with *ultima*, but for the present I prefer to retain *spreta* from the shallower South African waters as a separate species.

Fam. **Solenomyidae**

Solenomya occidentalis Desh.

Ligament posterior, supported internally by a well-developed shelf. No ridge (or only a very slight one) in front of insertion of posterior adductor muscle.

Length 38, alt. 13 mm.

Off west coast of Cape Peninsula (Lion's Head, N. 78° E., distant 12 miles), 60 fathoms, 2 living; False Bay, 22–42 fathoms, 4 and 3 juv., living; off Cape Infanta, 47 fathoms, 2 living (S. Afr. Mus. P.F. coll.). Off Saldanha Bay, 75-85 fathoms (U.C.T.). False Bay (U.C.T.).

Remarks. Sowerby (1897, p. 27) recorded *togata* Poli (= *mediterranea* Lam.) from Durban; but he identified P.F. shells, from the above three localities, as *occidentalis*. Turton (1932) recorded Port Alfred specimens as *mediterranea*.

Macnae & Kalk (1958, p. 129) list *S. occidentalis ?togata* from Delagoa Bay.

Fam. **Arcidae**

Arca navicularis Brug.

Arca navicularis Brug., Smith, 1903, p. 395; Braga, 1952, p. 102, pl. 8, fig. 4.

Fossil: Post Pliocene, Inhambane (Cox, 1939).

Durban (Smith); Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also U.W.); Inhambane (Braga). Durban harbour sediments (Dr. Lester King).

Distribution. East Africa, Madagascar, Indo-Pacific.

Arca (*Trisidos*) *tortuosa* Linn.

Arca tortuosa Linn., Chenu, 1862, fig. 871.

Delagoa Bay (S. Afr. Mus. coll. K.H.B.).

Distribution. Madagascar, East Indies. Not mentioned by von Martens (1879, 1880) as occurring in East Africa.

Arca semitorta Lam.

Arca semitorta Lam., Braga, 1952, p. 103, pl. 9, fig. 1.

Delagoa Bay (Braga; also S. Afr. Mus. coll. K.H.B.).

Arca avellana Lam.

Fig. 2 *b*

Arca acuminata Krauss, 1848, p. 14, pl. 1, fig. 11; Turton, 1932, p. 217.
Arca kraussii Krauss, 1848, p. 14, pl. 1, fig. 13; Philippi, 1849, p. 88, pl. 5, figs. 8–10; Cox, 1930b, p. 154, pl. 17 B; Turton, 1932, p. 217; Day & Morgans, 1956, p. 307.
Arca kraussii var. *inflata* Krauss, 1848, p. 15; Turton, 1932, p. 217.
Arca scabra (*non* Poli), Sowerby, 1892, p. 65.
Arca imbricata Brug. and var. *arabica* Nardini, 1937, p. 242, pl. 15(9), figs. 17, 18; Braga, 1952, p. 103; Day & Morgans, 1956, p. 307.
Arca avellana Lam., Prashad, 1932, p. 32 (references & synonymy); Adam & Leloup, 1939, p. 38, pl. 3, fig. 1.
[*Non*] † *Cucullaea kraussii* Tate, 1867.

Prodissoconch 0·3 mm., brown, conical, the rim not raised above the succeeding shell (contrast *plicata*). Area 'white-margined' (Krauss), i.e. the ligament does not cover the whole of the area, longitudinally striate, with dark transverse lines (corresponding to the teeth) showing through the shell substance; ligament thin, smooth, a slightly oblique groove from umbo to hinge-line filled with fibrous ligament, 3–4 additional incomplete (not starting from umbo) grooves (see Krauss's figure).

Length 26, alt. 16, width (valves together) 15 mm. Krauss gave 18 × 9·5 × 10, Paris lines 38 × 20 × 21·5 mm.

Fossil: Mio-Pliocene, Redhouse, Port Elizabeth (Cox 1930); Post Pliocene, Inhambane (Cox, 1939).

Natal Point (Durban) (Krauss); Umlaas River Mouth (Natal) (S. Afr. Mus.); Durban Bay and Isipingo (U.C.T.); Inhambane (Braga); Bazarute Island (S. Afr. Mus.).

I have seen a typical 'acuminata', living, from Xora (Elliotdale Division) (C. Walker coll.).

Off Cape Natal (Durban), 54 fathoms, one worn valve, and 85 fathoms, 5 valves; off Tugela River (Natal), 65–80 fathoms, one juv. valve; off Cape Vidal (Zululand), 80–100 fathoms, one valve; off Cape Morgan, 52 fathoms, 2 valves; of Hood Point (East London), 49 fathoms, one living, 9 valves; 34° 27′ S., 25° 42′ E., 256 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, east coast of Africa, Mauritius, Madagascar, Indo-Pacific.

Remarks. Krauss said *kraussii* was nearest to *arabica*; von Martens (1880) recorded both species from Mauritius; Dautzenberg (1929) regarded *kraussii* as a synonym of *arabica*, and the latter as a variety of *imbricata.*

The name *imbricata* Brug. is restricted to the West Indies form.

Cox figured a fossil shell from Redhouse, Port Elizabeth, which he thought was probably *kraussii* distorted by growing in a narrow crevice; he did not mention *acuminata* Krss., with the figure of which the fossil closely agrees.

Arca (*Anadara*) *uropigimelana* Bory

Arca uropigimelana Bory St. Vincent, 1824, p. 156, pl. 307, fig. 2; Adam & Leloup, 1939, p. 42.
Arca uropygmelana von Martens, 1880, p. 320; Lamy, 1907, p. 207; Dautzenberg, 1929, p. 580.
Arca holoserica Reeve, 1843, pl. 2, fig. 11.

Area wide, ligament with 2–3 divergent lines. None of the ribs subdivided by sulci or striae. Length 55, alt. 50 mm.

Delagoa Bay, Chinde (mouth of Zambesi River), and Beira (S. Afr. Mus. coll. K.H.B.).

Distribution. East coast of Africa, Madagascar, Mauritius, East Indies.

Remarks. Sherborn (Index Animal.) gave *uropigimelana* as 'n. et f.' i.e. *nom. nud.*, and did not include it in the list of Trivialia.

Anadara morrumbenensis Cox (1939, p. 81, pl. 2, figs. 19 *a*, *b*), seems to be allied, but is proportionately higher: length 39, alt. 38 mm., and has only about 16 ribs.

Arca (*Anadara*) *erythraeensis* Jonas

Arca erythraeensis Jonas, Dunker, 1858, p. 123, pl. 40, figs. 6–8; Smith, 1903, p. 395; Braga, 1952, p. 105, pl. 9, fig. 3.

Area wide, ligament with 3 divergent lines. Ribs on anterior part and on anterior half of middle part subdivided by a sulcus (on shells over 20 mm. long); anterior part regulose. Internally white. Periostracum fimbriate. Length 75, alt. 45 mm.

Delagoa Bay (S. Afr. Mus. coll. Dr. J. D. F. Gilchrist; also K.H.B.; Braga; U.W.). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea.

Remarks. Tomlin labelled a specimen 'erythraeonensis'. Living examples were obtained by Dr. Gilchrist and U.W.

Arca (*Scapharca*) *natalensis* Krss.

Arca natalensis Krauss, 1848, p. 17, pl. 1, fig. 12; von Martens, 1880, p. 320; Dautzenberg, 1929, p. 580; Lamy, 1931, p. 304; Braga, 1952, p. 103, pl. 9, fig. 2.
[*Non*] *Arca natalensis* Macnae & Kalk, 1958, pp. 117, 129, fig. 23 *g*, *h*.
[*Non*] † *Arca natalensis* Baily, 1855 (nom. nov. *bailyi* Brnrd., 1962b.)

Right valve smaller than left. Ribs not subdivided. Length 61, alt. 50, width (valves together) 42 mm.; also 68 × 63 mm.

Natal Point (Durban) (Krauss), Richards Bay (U.C.T.), Delagoa Bay (Braga). Durban harbour sediments (Dr. Lester King).

Off Tugela River (Natal), 24 fathoms, 4 living; Cape St. Blaize N.E. ½ N., 8 miles, 36 fathoms, one and one juv. (22 mm.) living, one dead (both valves intact) (S. Afr. Mus. P.F. coll.).

31° 38′ S., 29° 34′ E., 26 fathoms (U.C.T.).

Distribution. Mauritius, Madagascar. Also Quaternary deposits in Madagascar.

Remarks. Like *inaequivalvis* Brug. this species is inequivalve, and it is questionable whether Smith's specimen of the former from Durban was not really *natalensis*.

The figure given by Macnae & Kalk is the wrong shape for this species; it is more like *erythraeensis* or *antiquata*.

The occurrence of this species living so far west as Cape St. Blaize is noteworthy; confirmation is desirable. Lamy's (1931) record from Walvis Bay is even less acceptable, without confirmation.

The combination *Arca natalensis* Krauss antedates the same combination for the Cretaceous fossil species given by Baily 1855. For the latter I have proposed *Arca bailyi* (Barnard, 1962 b, p. 183).

Arca (*Scapharca*) *africana* Sow.

Arca africana Sowerby, 1904, p. 4, pl. 6, fig. 4.

Equivalve. Up to length 29, alt. 21, width 19 mm.

Off Tugela River (Natal), 46–55 fathoms (Sowerby, P.F. coll.).

Same locality, one living, 2 valves, cotypes; same locality, 40 fathoms, several living, and odd valves; off Umhloti River (Natal) 40 fathoms, one living, 4 valves (S. Afr. Mus. P.F. coll.).

29° 53′ S., 31° 06′ E., 71 metres (U.C.T.).

Durban harbour sediments (Dr. Lester King).

Cotypes in South African Museum. Reg. no. 14831.

Remarks. Compare *Anadara waylandi* Cox 1927 (p. 34, pl. 8, figs. 5–7), from the Lower Miocene, Pemba Island.

Arca (*Acar*) *plicata* (Chemn.) Dillwyn

Fig. 2 *a*

Arca plicata Dillwyn, 1817, p. 228; Dautzenberg, 1929, p. 577; Prashad, 1932, p. 50 (references & synonymy); Nardini, 1937, p. 243, pl. 16(10), figs. 1, 2; Adam & Leloup, 1939, p. 44, pl. 3, fig. 4; Nicklès, 1955, p. 115.

Arca domingensis Lamarck, 1818, p. 40; Lischke, 1869, p. 142; Melvill & Standen, 1899, p. 186; Smith, 1903, p. 395; Turton, 1932, p. 216.

Arca gradata Broderip & Sowerby, 1829, p. 365; Turton, 1932, p. 216.

Arca squamosa Krauss, 1848, p. 16.

Arca aghulhasensis Thiele, 1931, p. 177, pl. 6(1), figs. 12, 12*a*.

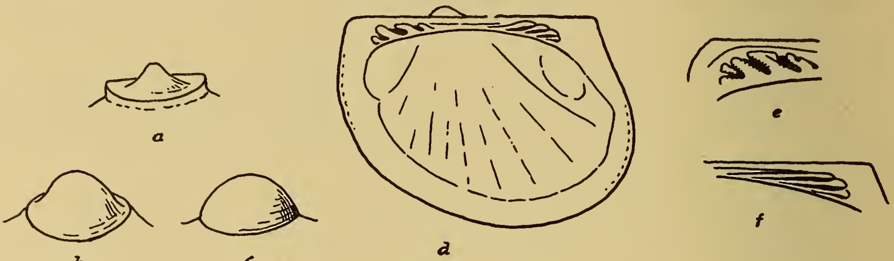


FIG. 2. Prodissoconch of: *a*. *Arca plicata* (Chemn.), *b*. *avelana* Lam. *c*. *obliquata* Gray. *d*. internal view of right valve of *Arca* (*Bathyarca*) *orientalis* Thiele (off Cape St. Blaize). *e*. anterior teeth of specimen from Browne's Bank. *f*. posterior teeth of specimen from Algoa Bay.

Prodissoconch 0·4 mm., with central conical tubercle, rim raised above succeeding shell (cf. Thiele). Ligament posterior to umbones, with very oblique close-set lines. Length 45, alt. 32 mm.

Fossil: Post Pliocene. Inhambane (Cox, 1939).

Natal (Krauss); Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also Braga); Umkomaas (Natal) (S. Afr. Mus. coll. Burnup); Port Alfred (Turton); Still Bay (S. Afr. Mus., coll. Muir), Port Edward (U.C.T.).

34° 51′ S., 19° 37′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres (Thiele).

Off Durnford Point (Zululand), 13 fathoms, one valve; off Tugela River (Natal), 24 fathoms, 2 valves; and 47 fathoms, one juv. living, one valve; off Cape Natal (Durban), 54 fathoms, 2 valves; off Illovo River (Natal), 27–30 fathoms, 5 valves; off Cape Morgan, 77 fathoms, one juv. living, several valves; of Nieca River (East London), 43 fathoms, 4 valves; 33° 3′ S., 27° 57′ E., 32 fathoms, one valve; 34° 5′ S., 25° 43′ E., 52 fathoms, 2 valves (S. Afr. Mus , P.F. coll.).

Distribution. Red Sea, Arabian Sea, Madagascar, Indo-Pacific, Cape Verde Islands, St. Helena.

Remarks. Only the 2 valves from 24 fathoms off Tugela River are large; all the other P.F. specimens are small (4–21 mm.).

In 1931 (p. 175) Thiele identified some worn shells from 31° 51′ S., 19° 37′ E., 80 metres, as *acerea* Melvill & Standen, 1899 (loc. cit. *supra*), a species from Torres Straits. From the same station other shells were taken which Thiele described as *agulhasensis*, allied to *plicata*. I consider the former a synonym; and I am inclined to regard the worn shells as conspecific. It seems unnecessary to bring into the fauna-list the name of a Torres Straits species when there are other better known species living in South African waters.

A. acerea is a very low species 15 × 7 mm., whereas Thiele's measurement of 18 × 10 mm. exactly fits some of the above-recorded specimens of *plicata*.

The *Pieter Faure* obtained no shells of any *Arca* species from the particular area west of Cape Agulhas whence the *Valdivia* obtained *agulhasensis* and 'acerea'. Dr. Muir found dead shells of *plicata* at Still Bay.

Arca (*Barbatia*) *bistrigata* Dnkr.

Arca bistrigata Dnkr., Braga, 1952, p. 105, pl. 8, fig. 6.

Upper part of posterior margin almost at right angles to dorsal margin of hinge-line. Area moderate, ligament with 2–3 divergent lines. Ribs on middle part subdivided by a sulcus (Braga: 2–3), nodulose; on anterior and posterior parts undivided, rugulose. Internally greenish. Periostracum fimbriate. Length 28, alt. 15 mm.; Braga: 32 × 16 mm.

Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also Braga).

Remarks. The subdivision of the ribs appears to begin at an earlier stage than in *erythraeensis*.

Arca (*Barbatia*) *obliquata* Gray

Fig. 2 *c*

Arca obliquata Gray, 1837, p. 65; Sowerby, 1892, p. 65; Johnson, 1904, p. 9; Krige, 1933, pp. 51, 52; van Bruggen, 1952, p. 12, pl. 1, fig. 1 (worn specimen, bad photo).

Arca alfredensis Bartsch, 1915, p. 182, pl. 46, figs. 9, 10; Turton, 1932, p. 216; Reinhart, 1935, p. 26; Day & Morgans, 1956, p. 307.

Prodissoconch 0·25 mm., strongly convex, button-like, margin not raised above succeding shell. In juveniles up to 3–4 mm. long the shape is oblong-oval, the altitude being nearly the same fore and aft; but thereafter the altitude increases posteriorly more rapidly than anteriorly. Area narrow, ligament mostly posterior, with very oblique lines. Up to length 50, alt. 30 (greatest altitude perpendicular to hinge-line; perpendicular from umbo to ventral margin *c.* 19), width (valves together), 18 mm.

Fossil: Post Pliocene, Inhambane (Cox, 1939); Pleistocene; raised beach, Algoa Bay (Johnson); Durban (Krige; also Geol. Survey specimens seen by me).

Natal Point (Durban) (Krauss); Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); Knysna, Mossel Bay, Still Bay, St. Sebastian Bay, Umzikaba (North of Port St. Johns) (S. Afr. Mus.); Scottburgh (Natal) and Delagoa Bay (S. Afr. Mus. coll. K.H.B.); Barzarute Island (S. Afr. Mus.).

False Bay; Umhlanga (Natal) and Durban Bay (U.C.T.).

Distribution. Indo-Pacific.

Remarks. This seems to be a littoral species; it was not taken by the *Pieter Faure*, and does not occur in any of the bottom-samples.

The Muir series from Still Bay includes juveniles from 1·5 mm. upwards.

Arca (*Barbatia*) *helblingii* Brug.

Arca helblingi Bruguière, 1789, p. 99.
Arca ovata Gmelin, 1790, p. 3307.
Arca velata Sowerby, 1833, p. 18; von Martens, 1880, p. 320.
Arca nivea Chemn., Krauss, 1848, p. 16; Dautzenberg, 1929, p. 576; Turton, 1932, p. 217; Krige, 1933, p. 51; Nardini, 1937, p. 241, pl. 15(9), fig. 15; Adam & Leloup, 1939, p. 41, pl. 3, fig. 3.
Arca nivea var. *velata* Braga, 1952, p. 104, pl. 8, fig. 7.

Ribs on posterior part subdivided by a sulcus; contrast *natalensis*.

Fossil: Pleistocene, Durban (Krige).

Natal, living (Krauss); Durban and Natal, living (S. Afr. Mus.); Delagoa Bay, living (S. Afr. Mus. coll. K.H.B.); Port Alfred 'very rare' (presumably dead) (Turton); Umpangazi, Zululand, living (U.C.T.). Durban harbour sediments (Dr. Lester King).

Off Umtwalumi River (south of Scottburgh, Natal), 25 fathoms, 3 living; off Umhloti River (Natal), 40 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. Krauss regarded *helblingii* as the juvenile of *nivea*. Sowerby identified P.F. shells as *nivea*. My larger Delagoa Bay shells were labelled *helblingii* by Tomlin.

Numerous odd valves, none over 14 mm. long, from the following localities: St. Francis Bay 24–34 fathoms; off Hood Point (East London), 49 fathoms; off Cape Morgan, 77 fathoms; off Cape Natal (Durban), 54 fathoms; off Tugela River (Natal), 65–80 fathoms; off Durnford Point (Zululand), 90 fathoms (S. Afr. Mus. P.F. coll.) may be referable to this species, which seems moderately common on the Natal coast.

Arca (*Barbatia*) *decussata* Sow.

Arca decussata Sow., Thiele, 1931, p. 174; Prashad, 1932, p. 42 (reference); Braga, 1952, p. 105, pl. 8, fig. 8; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, p. 37; Broekhuysen & Taylor, 1959, p. 292.

Four living specimens from Table Bay, 136 fathoms, the largest 18 × 10 mm. (S. Afr. Mus. P.F. coll.) were identified by Tomlin as *decussata* Sow. Similar specimens were obtained at Saldanha Bay by U.C.T. The *Pieter Faure* also obtained one living example, 11 mm., off East London, 47 fathoms.

There are no authentic specimens of *decussata* in South African Museum for comparison. Braga's figure of a larger shell is very similar to a shell identified by Tomlin as *helblingii* (q.v.).

Fossil: Post Pliocene, Inhambane (Cox, 1939).

Delagoa Bay (Braga); Kosi Bay and Inhambane (U.C.T.).

Arca (*Barbatia*) *cafria* Bartsch

Arca cafria Bartsch, 1915, p. 183, pl. 38, figs. 1, 5.
Noetia cafria (Bartsch), Reinhart, 1935, p. 48.
Cardita rufanensis Turton, 1932, p. 131, pl. 60, no. 1615 (= juv.).

Prodissoconch 0·2 mm., smooth. Obliquely oval, deeper posteriorly; margin, especially hind margin, scalloped. Radially ribbed, broad and narrow ribs alternating, the broad ribs may be striated, and are sometimes double; crossed by growth-lines and more or less nodulose; narrow ribs much more deeply indented by the growth-lines and consequently beaded or moniliform. In juveniles up to *c.* 1·5 mm. there are *c.* 15 radial ribs, the growth-lines strong, and the sculpture clathrate. Thereafter intermediate ribs develop.

Area with transverse grooves; at 5 mm. shell length 2 anterior, at 8 mm. 3 anterior, 3 posterior, at 17 mm. *c.* 7 anterior and 12 posterior. Teeth at 2·5 mm. shell length 10–11, at 4 mm. 16–17, at 7–8 mm. 22–25, at 10–12 mm. 26–28 those in the middle becoming very narrow, linear.

Margin internally crenulate. Posterior adductor scar bordered anteriorly by a ridge or flange. Periostracum dark brown, fibrous-setose, chiefly in the grooves between the ribs.

Length 14·2, alt. 8·5 mm. (Bartsch). A worn Port Alfred shell in South African Museum 17·5 × 13 mm.

Port Alfred (Bartsch, Turton).

Off Tugela River (Natal), 14 fathoms, 2 living, several valves 2·5–15 mm.; and 47 fathoms, 5 valves; off Tongaat (Natal), 46 fathoms, two valves; off Umhloti River (Natal), 40 fathoms, 10 valves; off Illovo River (Natal), 30 fathoms, 8 valves; off Umkomaas (Natal), 40 fathoms, 2 valves; off Itongazi (Natal), 25 fathoms, 2 valves; off Cove Rock (East London), 22 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. The shape and the alternating broad and narrow ribs are distinctive.

Large shells are liable to become distorted from being cramped in crevices, e.g. the Port Alfred shell mentioned above.

The *Pieter Faure* took no living shells, but several of the valves are quite fresh and retain portions of the periostracum. The ligament grooves on the area appear to be more numerous than shown in Bartsch's fig. 5.

This species according to Lamy (1931, p. 305) appears to be very similar to *A.* (*Noetia*) *lateralis* Rve., which he records (p. 304) from Walvis Bay.

The West African *gambiensis* Rve. also appears to have a similar shape and alternating broad and narrow ribs.

Turton's *Cardita rufanensis* appears to be undoubtedly a juvenile of this species. There is even a suspicion of taxodont dentition to be seen in the photograph.

Arca (*Arcopsis*) *gibba* Krss.

Arca lactea var. *gibba* Krauss, 1848, p. 16.
Arca lactea Smith, 1891, p. 394; Sowerby, 1892, p. 65.
Arca gibba Krss., Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, pp. 37, 129.

Area wide. Ligament rhomboidal (triangular on each valve) transversely striated, dark brown or blackish, occupying only about one half the length of area. Length 17, alt. 12, width (valves together) 11·5 mm.

Fossil: Post Pliocene, Inhambane (Cox, 1939).

Natal (Krauss); Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton).

Living: Port Elizabeth (R. N. Kilburn, 1960, specimen seen by me); Umzikaba (S. Afr. Mus.); Scottburgh, Natal (K.H.B.); Umhlanga, Inyoni and Durban Bay (Natal) (U.C.T.); Delagoa Bay (K.H.B.; also U.W.).

Off Durnford Point (Zululand), 13 fathoms, 3; off Tugela River (Natal), 14 fathoms, several valves; off Morewood Cove (Natal), 27 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. One specimen has a linear extension of the ligament posteriorly along the dorsal hinge-line, but not extending to the end of the area.

South African Museum (coll. R. M. Lightfoot) has one worn valve from Kalk Bay (False Bay). Unless some error has occurred, this must be a very unusual 'wash-up'; the species was not taken by the P.F. nor by U.C.T. in False Bay; Dr. Muir did not obtain it at Still Bay. The farthest west locality where it is known to be living is Port Elizabeth.

Thiele (1931, p. 174) considered *gibba* to be conspecific with *afra* Gmelin, which occurs at Querimba Island and other localities on the coast of East Africa.

Arca (*Bathyarca*) *orientalis* Thiele

Fig. 2 *d*, *e*, *f*

Arca (*Bathyarca*) *orientalis* Thiele, 1931, p. 179, pl. 6(1), fig. 14.

Almost equivalve, but the left valve very slightly the larger, obliquely inequilateral, hinge-line straight, nearly equal to length of shell. Fine concentric and radiating ribs forming a more or less distinct cancellate sculpture, visible on dead shells; on living shells the radial ribs are accentuated by the setose periostracum, especially towards the margin. Periostracum overlapping margin.

Teeth (3)4 anterior, oblique, (4)5 very oblique, almost horizontal (parallel with hinge-line) posterior. Juveniles have 2 anterior and 3 posterior teeth. Margin internally very obscurely crenulate, visible only near the dorsal margin anteriorly and posteriorly. Length 5·5, alt. 4, hinge-line 4·5 mm. White with brown periostracum.

35° 16′ S., 22° 26′ E., 155 metres; 35° 19′ S., 20° 12′ E., 126 metres (Thiele).

Off Umhloti River (Natal), 40 fathoms, 3 valves; off Cape Natal (Durban), 40 fathoms, 13 living; off Hood Point (East London), 49 fathoms, 2 living; 33° 4′ S., 27° 54′ E., 27 fathoms, one valve; 34° 26′ S., 25° 42′ E., 124 fathoms, 5 valves; off Cape St. Francis, 70 fathoms, 2 living, 2 valves; Browne's Bank (approx. 36½° S., 21½° E.), 80–100 fathoms, 3 living; off Cape St. Blaize, 125 fathoms, 5 living, 17 valves; Cape Point, N. 40° E., 120 fathoms, 3 living; Cape Point N.E. ½ N., 145 fathoms, one living (S. Afr. Mus. P.F. coll.).

1

34° 25′ S., 17° 36′ E., 1,240 metres, 2 and one juv., living; 34° 17′ S., 17° 53′ E., 320 metres, one living; 34° 51′ S., 23° 41′ E., 100 fathoms, one living (U.C.T.).

Distribution. Dar-es-Salaam and Zanzibar Channel, 404 and 463 metres (Thiele).

Remarks. There is no doubt that the P.F. specimens are conspecific with those obtained by the *Valdivia* and described by Thiele. The *Valdivia* also obtained specimens off the East African coast, which Thiele considered conspecific in spite of certain minor differences. That may be correct, but in any case Thiele, by figuring a specimen from the Agulhas Bank, has fixed this locality (35° 16′ S., 22° 26′ E.) as the type locality for *orientalis.*

Thiele's description lacks details. The South African specimens were stated to have 'as a rule less numerous teeth' than the East African specimens, but the number of teeth in the latter was not mentioned, and no figure of the teeth was given.

Similar in shape to the North Atlantic *pectunculoides* Scacchi (see Sars, 1878, pl. 4, figs. 2 *a–c*), and to the Persian Gulf *anaclima* Melvill & Standen (1906, p. 54, fig. 6; also Thiele, 1931, pl. 6(1), fig. 13).

The posterior teeth in the present specimens are more horizontal than shown in Sars's figure. Thiele gave the number of teeth in East African specimens of *anaclima* as usually 4. Here there are usually 4 anterior and 5 posterior teeth; there may be only 3 anterior teeth or the outermost may be partly or completely bifid, making 4 teeth. When there are only 4 posterior teeth, they are quite horizontal; the outermost may be partly or completely bifid (i.e. 6 teeth, but this occurred in only one shell).

The teeth do not fit the figure of *frielei* (Jeffreys, 1879, pl. 45, fig. 4).

A. profundicola Verrill & Smith (1885, p. 439, pl. 45, figs. 23, 23*a*) has almost horizontal posterior teeth, but the total number of teeth is greater, and the shell is more oblique. Dautzenberg (1927, p. 283) suggested that *profundicola* and *pteroessa* Smith (1885, p. 262, pl. 17, figs. 4, 4 *a, b*) were synonymous; but Smith's figure shows the posterior teeth more oblique. Thiele (1931, pp. 172, 178) seemed doubtful about the synonymy.

One of the Hood Point shells is more oblique than the other shells, as here figured, length 3, alt. 2·3 mm.; the other shell is less oblique, length 2·75, alt. 2·5 mm.

The Cape Natal specimens are very fragile, but that may be due to long sojourn in the bottom-sample saturated with formalin.

Gen. Deltaodon Brnrd.

Barnard, 1962a, p. 249.

Shell equivalve, inequilateral, area short and very narrow; umbones approximate; no ventral gape; margin internally smooth. Anterior teeth forming a D-shaped group, posterior teeth oblique, a shallow oblique groove separating the two groups.

Seems to differ from the other Arcid genera and subgenera in the greatly reduced dorsal area, and the strong hinge with two groups of teeth. The anterior group as a whole is D-shaped, and the individual teeth radiate and bifurcate like the river mouths in a delta.

Deltaodon tugelae Brnrd.

Deltaodon tugelae Barnard, 1962a, p. 249, fig. 2.

From a bottom-sample off Natal–Zululand (exact locality not recorded) (S. Afr. Mus. A9477, P.F. coll.). One valve attached to a *Xenophora pallidula*, trawled off the Zululand coast, 160–180 fathoms.

Types in South African Museum; two cotypes in Natal Museum.

Named after the Tugela River, the boundary between Natal and Zululand.

Fam. **Glycimeridae**

Gen. GLYCIMERIS Da Costa

(syn. PECTUNCULUS Lam.)

1.	Slightly inequilateral. About 24 narrow ribs with 2–4 intermediaries between each pair. Up to 32 mm.	*connollyi*
2.	Equilateral. Numerous ribs subequal in width to the grooves, both ribs and grooves finely striated. Up to 60–70 mm.	*queketti*
3.	Nearly equilateral. A few broad ribs, broader than the grooves. (S. African examples) 18 mm.	cf. *pectiniformis*

Glycimeris connollyi Tomlin

Fig. 3 *a*, *b*, *c*

Pectunculus inaequalis (*non* Sow.) Krauss, 1848, p. 18; Sowerby, 1892, p. 66.
Pectunculus arabicus (*non* Adams) Sowerby, 1892, p. 66.
Pectunculus castaneus (*non* Lam.) Sowerby, 1904, p. 4.
Glycimeris connollyi Tomlin, 1923, p. 299, pl. 16, fig. 12; Turton, 1932, p. 215; van Bruggen, 1952, p. 12; Barnard, 1962b, p. 183.
Pectunculus kraussi Thiele, 1931, p. 193.
Glycimeris multistriata Turton, 1932, p. 215, pl. 55, no. 1495.

Length a little more than altitude; slightly inequilateral; posterior margin slightly pointed (i.e. less rounded than anterior margin). About 20–24 radiating, narrow, well-defined ribs in middle part, with 4–5 fine riblets in the intervening grooves; anterior and posterior parts with numerous fine riblets of equal strength. Concentric growth-lines producing a finely beaded appearance on the ribs, and a more or less punctate sculpture between the riblets in the grooves. Teeth at 2 mm. shell length 8, at 3 mm. 10, at 5 mm. 12, at 10 mm. 16, and in adult 20–24, those in the middle feeble and variable. Margin internally crenulate; on an *adult* shell 5 crenulations cover 5 mm.

Periostracum thin, shortly fibrous, usually more or less abraded except on the anterior and posterior parts of shell.

Up to length 31, alt. 28 mm. (Tomlin); 32 × 29 mm. (S. Afr. Mus.). Yellowish, marbled with reddish-brown zigzag or cuneiform marks, uniform when full grown, periostracum brown. Interior becoming orange-brown in beach-weathered shells.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Table Bay (Krauss); False Bay, Mossel Bay (Tomlin); Table Bay, Hermanus, Still Bay, Mossel Bay (S. Afr. Mus.); Port Alfred (Turton).

Off west coast of Cape Peninsula, 250 fathoms, odd valves (Sowerby, P.F. coll.).

34° 8′ S., 24° 59′ E., 33° 50′ S., 25° 48′ E.; 35° 29′ S., 21° 2′ E., 102 metres; 36° 26′ S., 20° 56′ E. (Thiele).

Dead shells: from numerous localities from Durban area (Umhloti, Morewood, Illovo, Umkomaas), Cape Morgan and East London area, Algoa Bay and Agulhas Bank, to False Bay; living: False Bay, 28 fathoms (S. Afr. Mus. P.F. coll.).

Algoa Bay, Mossel Bay, False Bay, 34° 33′ S., 21° 28′ E., 67 metres, living (U.C.T.).

Remarks. Tomlin's specimens were evidently beach-worn, and neither his description nor his photographic illustration express the characteristic sculpturing of this species. In worn shells the ribs naturally tend to become broader. In living and fresh shells the main ribs (in middle part of shell) are narrow (Thiele: 'fein'), with finer ones between them.

In shells up to *c.* 6–8 mm. long the ribs are all subequal in strength, with here and there perhaps a finer intermediary; thereafter intermediaries develop between each pair of main ribs, increasing in number from 1 to 4 or sometimes 5. Thiele's description is correct, except that the word 'stärkere' seems to be a *laps. cal.* for 'schwächere'.

Sowerby's record of *arabicus* probably belongs here. If the specimen really was *arabicus*, it was probably not South African (the species occurs in the Red Sea, Madagascar, and possibly along the east coast of Africa).

Sowerby (1904) recorded 'odd valves' from the P.F. collection but he returned 2 complete shells labelled *castaneus*.

This record, Krauss's record from Table Bay, and 2 juvenile beach shells in South African Museum, appear to be the only records from the west coast. As shown by the P.F. bottom-samples the species is more abundant from Natal to Algoa Bay, becoming less abundant westwards to False Bay.

Named after the late Major M. Connolly, author of the Monograph of South African Non-marine Mollusca (*Ann. S. Afr. Mus.* xxxiii, 1939).

Aberr. an var. (fig. 3 *c*). Among numerous typical examples of *connollyi* found by Dr. A. R. H. Martin in Pleistocene deposits at Sedgefield, was a single valve which has distinctive characters (Barnard, 1962b, p. 183).

The external sculpture is typical *connollyi*, but the valve is as high as long (19·5 mm.), with prominent umbo, 8 posterior and 10 anterior teeth, with feeble linear ones between, and 6 crenulations in a length of 5 mm. on the margin. The valve is also heavier than equal-sized valves of typical *connollyi.*

If several examples had been found, a separate specific name might have been justified. A parallel case occurs in *pilosa-queketti*, the fossil *pilosa* differing from the living *queketti* in having more inflated umbones (*v. infra*). Also in *Tivela compressa—tomlini* (p. 506).

Glycimeris queketti (Sow.)

Fig. 3 *d*

Pectunculus queketti Sowerby, 1897, p. 27, pl. 7, figs. 8, 9; Braga, 1952, p. 106, pl. 9, fig. 6.
Glycimeris queketti (Sow.), Bartsch, 1915, p. 181; Krige, 1927, pp. 69, 77; Turton, 1932, p. 215; Cox, 1939, p. 96; Macnae & Kalk, 1958, p. 129 (*queckettii* [*sic*]); Barnard, 1962b, p. 183.

Length and altitude subequal, nearly equilateral. Numerous radiating ribs, rounded and not sharply defined, subequal in width to the grooves; both ribs and grooves finely striated. Concentric growth-lines, more or less distinctly marked by punctae when the bristly periostracum is abraded; and producing an obliquely striate appearance on the lateral areas.

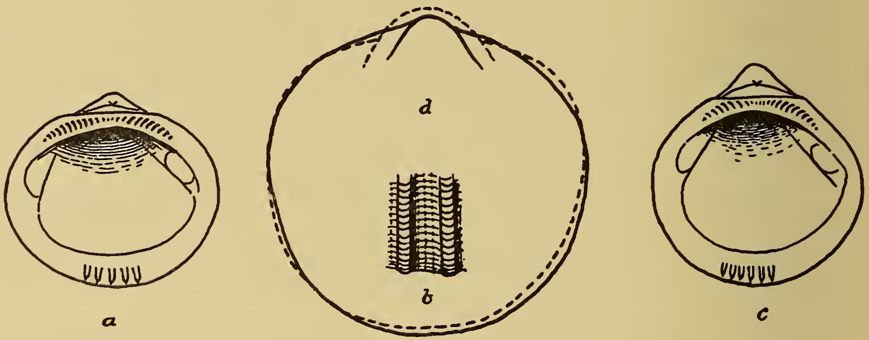


Fig. 3. *a*, *b*. *Glycimeris connollyi* Tomlin, with detail of ribbing further enlarged. *c*. *G. connollyi* var. from Sedgefield. *d*. outline of *G. queketti* Sow. superimposed on outline (dotted) of Newton's figure of †*pilosa*.

Teeth at 4 mm. shell length 9–10, at 7 mm. 14, at 15 mm. 18, increasing to 22–24, with a few feeble and indistinct ones in the middle. Margin internally crenulate.

Periostracum thin, shortly fibrous, usually abraded except on lateral parts of shell.

Up to length 65, alt. 65 mm. (Sowerby); 56 × 53 mm., 63 × 58 mm., and 78 × 76 mm. (S. Afr. Mus.).

Yellowish-brown, juveniles often with zigzag or arrow-like markings, periostracum brown; impressions of adductor muscles with orange-brown radial streaks.

Fossil: Post Pliocene; Inhambane (Cox).

Durban (Sowerby); Port Alfred, dead (Bartsch, Turton).

Natal: from Tugela River to Umtwalumi (between Umkomaas and Port Shepstone), 27–54 fathoms, living and dead (S. Afr. Mus. P.F. coll.).

Delagoa Bay (Braga: also U.W.).

Remarks. I have not seen the U.W. Delagoa Bay examples.

A comparison between the South African *queketti* and *pectunculus* (Linn.), which occurs at Madagascar (Dautzenberg 1929), would be interesting.

In the Pliocene deposits at Redhouse and Koega River (Port Elizabeth) very large shells up to 105 mm. occur, which have been identified with *pilosa* (Linn.), a species from the European Mio-Pliocene deposits, and also living in the Mediterranean. The South African fossil shells differ from *queketti* in having inflated umbones (fig. 3 *d*) (cf. *supra* p. 380) (Bullen Newton, 1913, p. 333, pl. 19, figs. 3, 4).

Cox (1939, pp. 67, 82) considered that these fossil shells are probably conspecific with shells from the Pliocene of Inhambane; and, although very close to *pilosa*, regarded them as a distinct species: *africana* Cox (1939, p. 81, pl. 2, fig. 11).

Two valves in South African Museum, the larger length 78, alt. 76 mm., are said to have been collected south of Skulpfontein Point, i.e. in the Hondeklip Bay area (west coast). They do not differ from *queketti*; the umbones are not inflated. They are worn nearly smooth externally, but internally the teeth are not much worn, and the hinge-line area is shiny; there are orange-brown patches at the adductor muscle scars.

Glycimeris (or *Pectunculus*) was not recorded by Haughton (1932) although it had been recorded by Krige (1927, pp. 69, 77) from Velddrift, Berg River mouth. But the genus occurs in the Bredasdorp Beds at De Hoop (Wybergh, 1920, p. 57).

Skulpfontein as a locality for *queketti* is not fully acceptable in spite of Krige's west coast record (Barnard, 1962b, p. 183).

Glycimeris cf. *pectiniformis* (Lam.)

Pectunculus pectiniformis (Lam.), Bruguière, 1797, pl. 311, fig. 5; Chenu, 1862, fig. 878; von Martens, 1879, p. 741.

Some worn valves are comparable in general with *pectiniformis* Lam. as represented in the figures quoted above.

There are 13–14 (11–12 in juv.) broad rounded ribs, subequal to or slightly wider than the grooves; the surface is worn, but there do not appear to be any subsidiary striae on the ribs (as are shown in Chenu's fig. 877 of *delesserti*).

Teeth at 4 mm. shell length 9–10, at 10 mm. 12, and 16 in a larger valve.

Length 18, alt. 17 mm. A fragment indicates that the species may reach 25 mm.

Cape Natal (Durban), 54 fathoms, 2; off Umhloti River, 40 fathoms, one; off Illovo River, 27–30 fathoms, one juv.; off O'Neil Peak (Zululand), 90 fathoms, 3 (S. Afr. Mus. P.F. coll.).

Distribution. Querimba Island (von Martens).

Remarks. Smith (1891, p. 432) regarded *pectiniformis* as a synonym of the earlier *Cardium amboinense* Gmelin 1790.

Fam. **Limopsidae**

Three of the South African species are now shown to be incubatory: *Philobrya angulata* and *limoides*, and *Hochstetterina velaini*.

Gen. Limopsis Da Costa

Clear-cut diagnoses of species in this genus seem difficult to formulate. The varying obliquity of the shell, and the convexity of the anterior and posterior margins are not helpfully expressed by such words as 'valde obliqua', 'un peu plus oblique', 'wenig schief'. In spite of this difficulty in defining species, *varieties* also have been named, e.g. 5 varieties of *minuta*, 8 varieties of *aurita*!

Study of the P.F. material seems to show that there are 3 distinct species inhabiting the continental shelf down to 200 fathoms, and another species (recently discovered) living at greater depths.

There is no difficulty in distinguishing these South African species according to the diagrams here given (fig. 4). Exact mathematical agreement must not be expected in every individual shell, especially in worn valves. Two lines perpendicular to the (upper) hinge-line divide the shell into 3 areas, the relative proportions of which are easy to measure. Each species may thus be defined by a formula, supported by other characters such as number of teeth, presence or absence of crenulations on internal margin, and external sculpture. An additional perpendicular from the umbo is required in case two species have the same outline, but differently placed umbones.

1. Altitude usually less than length, sometimes subequal.
    (*a*) Umbo approximately in middle of hinge-line.
        i. a twice in m, and $1\frac{1}{3}$ times in p. Margin internally crenulate .. .. *chuni*
        ii. a 3 times in m, and $2\frac{1}{3}$ in p. Margin internally smooth .. .. cf. *straminea**
    (*b*) Umbo distinctly nearer to anterior end. Shoulders at ends of hinge-line rectangular. Sculpture cancellate .. .. *natalis***
2. Altitude greater than length .. .. *anceps*

The question, however, arises as to the correct names of the South African species. There can scarcely be any doubt that Adams obtained a specimen of one or other of the two species of which numerous examples were later obtained by the *Valdivia* and described by Thiele (and also by the P.F.).

Adams (1862, p. 230) stated: 'This is the species actually dredged from 136 fathoms [*sic. Voy. Samarang*, p. 76 has: 120], off the Cape, during the voyage of H.M.S. *Samarang*.' His description was quite inadequate, but his species was synonymized with *minuta* by both Jeffreys and Smith. Authentic examples of *minuta* are not available to me. The figures of *minuta* differ; Jeffreys's 1879 figure shows a shell higher than long; Sars's 1878 figure shows the height subequal to the length. Lamy (1912) accepted both figures as applying to *minuta*; and also the figures given by Bush (1893), and Verrill & Bush (1898), which agree with Sars's figure.

* Barnard, 1963b, p. 449.

** Barnard, *Ann. Natal Museum*. [In press.]

In face of this uncertainty only recourse to Adams's Type (if still extant) can settle the question. If *abyssicola* is a high species, Adams's name will displace *anceps* Thiele; if it is subcircular, *chuni* Thiele will become a synonym. In the meantime Thiele's specific names are used here.

All the species have a bristly periostracum which overlaps the margin of the shell, especially ventrally.

Limopsis chuni Thiele

Fig. 4 *a*

Limopsis chuni Thiele, 1931, p. 183, pl. 6 (1), figs. 18 *a–c*.
Limopsis agulhasensis Thiele, 1931, p. 183, pl. 6 (1), fig. 19.

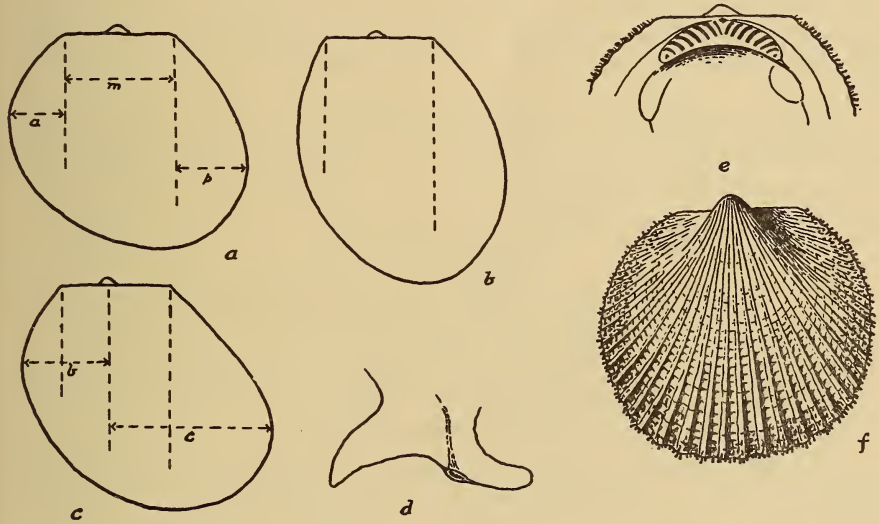


Fig. 4. *a, b, c.* outlines of *Limopsis chuni* Thiele, *anceps* Thiele, and a species cf. *straminea* Smith. *d. L.* cf. *straminea,* foot. *e, f.* internal and external views of *L. multistriata* (Forskål).

Subcircular, length slightly greater than altitude. (Formula *a* twice in *m*, 1⅓ times in *p*; *b* 1⅓ times in *c*). Concentric lirae, also fine radial striae. Internally no radial ribs; whole margin finely crenulate. Lower margin of hinge slightly arched. Teeth interrupted in middle; at 2 mm. shell length 3 teeth on each side, at 4 mm. 4, at 10 mm. 6–7 anterior, 5–6 posterior, increasing to respectively 8–9 (10) and 7–8 at 33 mm. length.

Up to length 35, alt. 30 mm. (S. Afr. Mus.); 36 × 32–33 mm. (Thiele).

Foot with posterior process, byssus rudimentary.

33° 41′ S., 18° 03′ E., 178 metres; 35° 10′ S., 23° 2′ E., 500 metres (*chuni*) (Thiele). 35° 16′ S., 22° 26′ E., 155 metres (*agulhasensis*) (Thiele).

From: off Cape Vidal (Zululand) 80–100 fathoms, Cape Natal (Durban), 54 and 85 fathoms, and the East London area, 39 fathoms, to Algoa Bay and St. Francis Bay, across the Agulhas Bank to Cape Point, off the west coast of the Cape Peninsula, off Table Bay (e.g. Lion's Head S.E. ½ E., 42 miles, 156 fathoms) (S. Afr. Mus. P.F. coll.).

32° 43′ S., 17° 39′ E., 222 metres, one living (*Africana I*, per U.C.T.).

Remarks. Although not recorded by Sowerby in his 1904 Report on the P.F. Bivalves, specimens were submitted to him, and identified as *belcheri* Ad. & Rve.

L. belcheri Ad. & Rve. was described (as *Pectunculus belcheri*) in 1850 from the Cape, but A. Adams in 1862 said it was really obtained in the Korean Archipelago. Both Krauss (1852, p. 29) and Sowerby (1892, p. 66) listed *belcheri* from the Cape, the latter in ignorance of, or in spite of, Adams's correction.

It is not clear, however, why Thiele instituted *agulhasensis*. Both species have approximately the same shape, the same number of teeth, and a crenulate inner margin. The P.F. material shows that *agulhasensis* is only the young of *chuni*.

The P.F. took living examples off the Zululand and Natal coast, but they (and the dead shells) are all of small size. The largest specimens came from off Cape Point and the west coast.

Limopsis anceps Thiele

Fig. 4 *b*

Limopsis anceps Thiele, 1931, p. 184, pl. 6 (1), figs. 20, 20 *a*.

Altitude greater than length, more noticeable in the larger shells; anterior margin almost perpendicular to hinge-line. (Formula: *a* 3 times in *m*, 2⅓ in *p*, *b* 1½ times in *c*.) Concentric lirae, also faint striae marking the radial arrangement of bristles. Internally a few rather broad radial pleats anteriorly and posteriorly, with finer ones between the two series; these pleats are in very low relief, but the stronger anterior and posterior ones form about 6 definite undulations on the margin (best seen in oblique view); Thiele's fig. 20 *a* shows these undulations on the posterior margin only. Lower margin of hinge slightly angular, as in Jeffreys's figure of *cristata* (1879, pl. 46, fig. 8) (contrast *minuta* pl. 46, fig. 9).

Teeth interrupted in middle, at 2 mm. shell length 2–3 on each side, at 4 mm. 3–4, increasing to 5–6.

Up to length 10, alt. 12 mm.

Foot with posterior process, byssus rudimentary.

35° 16′ S., 22° 26′ E., 155 metres; 35° 26′ S., 20° 56′ E. (Thiele).

From: off Cape Vidal, Durnford Point, and O'Neil Peak (Zululand), 80–100 fathoms, and Natal coast, 30–85 fathoms, to the East London area, Algoa Bay, and Agulhas Bank, but *not west* of Cape St. Blaize (approximately 22° E.), except the *Valdivia* record from 20° 56′ E.

Remarks. More abundant off the Zululand and Natal coast, where numerous living examples were taken, than farther southwestwards; only one living example was taken off Cape Morgan, and only dead shells in Algoa Bay and on the Agulhas Bank.

Limopsis multistriata (Forskål)

Fig. 4 *e*, *f*

Arca multistriata Forskal, 1775, p. 123.
Limopsis multistriata (Forskål) Chenu, 1862, fig. 881; Lamy, 1912, p. 132; Prashad, 1932, p. 58 (references and synonymy); Nardini, 1937, p. 249.
Pectunculus multistriata (Forskål) Dautzenberg, 1929, p. 582.
Limopsis lata (*non* Smith), Braga, 1952, p. 107.

Equilateral, subcircular. About 12 riblets on early part of shell (middle portion), with an intermediary between each pair developing later; at the margin in the larger shell the intermediaries are almost as strong as the primary riblets. Growth-lines well developed in the grooves, producing a cancellate sculpture. Margin internally wide, not crenulate. Largest shell with 27–28, the 9 mm. shell with 16, smallest with 12 teeth, the middle one or two feeble. Periostracum fibrous-fimbriate. Length and alt. 4·5 mm.; length 9·5, alt. 9 mm.; length and alt. 24 mm.

Foot with posterior process, byssus rudimentary.

Delagoa Bay, 2 juv. living (U.W.; also Braga); Inhambane, one living (U.C.T.); Durban, dead valves (coll. Kilburn).

Distribution. Red Sea; Indo-Pacific. Quaternary: Madagascar.

Remarks. This is probably the shell which Braga recorded as the New Zealand *lata* Smith; a most unlikely identification.

Limopsilla pumilio (Smith)

Limopsis pumilio Smith, 1904a, p. 43, pl. 3, figs. 27, 28.
Limopsilla pumilio (Smith), Thiele, 1923, p. 290; 1931, p. 187, pl. 6 (1), figs. 27, 27 *a*; Turton, 1932, p. 215, pl. 55, no. 1490 (juv.).

Length and altitude up to 3 mm.; Smith, altitude 3·25 mm.

Port Alfred (Smith, Turton); Still Bay (S. Afr. Mus. Muir coll.).

33° 41′ S., 18° 03′ E. (Table Bay), 178 metres; 34° 51′ S., 19° 37′ E., 80 metres; 33° 50′ S., 25° 48′ E.; 35° 16′ S., 22° 26′ E., 155 metres; 35° 26′ S., 20° 56′ E. (Thiele).

Umkomaas (Natal), 40 fathoms, one valve; Sandy Point (north of Kei River mouth), 51 fathoms, one valve; 34° 26′ S., 25° 42′ E., 124 fathoms, 9 valves; 34° 5′ S., 25° 55′ E., 67 fathoms, 13 valves; 33° 50′ S., 25° 54′ E., 4 valves (S. Afr. Mus. P.F. coll.).

Distribution. Great Fish Bay, Angola (Thiele).

Pleurodon pretiosus (Gould)

Nuculina pretiosus Gould, 1861, p. 31.
Nuculina ovalis (*non* Wood), Smith, 1885, p. 230, pl. 19, figs. 1, 1 *a*, *b*.
Limopsis pretiosus Thiele, 1931, p. 187; 1934, fig. 794.
Limopsis sp. Turton, 1932, p. 215, pl. 55, no. 1492.

Up to altitude 4 mm. Living examples are chestnut-brown in colour.

Simon's Bay (False Bay), 15–20 fathoms (Gould, Smith); Port Alfred (Turton).

34° 51′ S., 19° 31′ E., 80 metres; 34° 8′ S., 24° 59′ E., 80 metres; 33° 50′ S., 25° 48′ E. (Thiele).

Off Cape Natal (Durban), 54 fathoms, 2 valves; 34° 5′ S., 25° 55′ E., 67 fathoms, many valves; 34° 5′ S., 25° 43′ E., 52 fathoms, 6 valves; off Cape St. Blaize, 60 fathoms, 3 valves, and 125 fathoms, 6 valves; False Bay, 22 fathoms, many valves (S. Afr. Mus. P.F. coll.).

Living: Algoa Bay, 68 fathoms, Plettenberg Bay, 43–61 fathoms, and 34° 51′ S., 23° 41′ E., 100 fathoms (U.C.T.). Off Saldanha Bay, 150 fathoms; off Lamberts Bay, 92 fathoms (U.C.T.).

Distribution. Great Fish Bay, Angola (Thiele).

Gen. PHILOBRYA Carpenter

Philobrya meridionalis (Smith) (see Melvill & Standen, 1907, p. 145) needs a new name, if it has not already received one (? = *desolationis* Lamy, 1936, pp. 112, 113). *Mytilus meridionalis* Smith 1885 was preoccupied by Krauss 1848, and transference to another genus will not resuscitate a still-born name. Nevertheless the species was listed by Thiele (1912, p. 268) as *Philobrya meridionalis*.

On the other hand, the transference of *Hochstetteria limoides* Smith 1904 to the genus *Philobrya* necessitates a new name to avoid conflict with *Philobrya limoides* Smith 1907.

Philobrya angulata (Sow.)

Fig. 5 *a*

Neocardia angulata Sowerby, 1892, p. 63, pl. 3, fig. 66.
Hochstetteria alfredensis Bartsch, 1915, p. 184, pl. 39, figs. 6, 7.
Philobrya angulata (Sow.), Thiele, 1931, p. 190; van Bruggen, 1952, p. 6, fig. 1 (shell), fig. 2 (map).

Prodissoconch length 9·5, alt. 0·35 mm., slightly domed in middle of hinge-line, with 5–6 radiating, bifurcate riblets in middle part of shell, anteriorly and posteriorly 5–6 riblets branch off and curve towards the hinge-line; riblets not reaching margin which forms a strong raised rim.

Periostracum brown, scarious, especially on the riblets, which makes them appear broader than they really are, overlapping the margin, sometimes to the extent of 1 mm.

Up to length 6, alt. 6·75 mm. (P.F. coll.).

Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); East London (S. Afr. Mus.); Still Bay (S. Afr. Mus. coll. Muir).

False Bay and Port Elizabeth, living, attached to Hydroids; Algoa Bay, 15 fathoms (U.C.T.).

St. Francis Bay, Algoa Bay, and Agulhas Bank (Thiele).

Common in bottom-samples from numerous localities extending from off the Tugela River (Natal), East London, Port Alfred area, Algoa Bay, Agulhas Bank, to False Bay (S. Afr. Mus. P.F. coll.).

West coast of Cape Peninsula (34° 11′ S., 18° 20′ E.), 15 fathoms, living; Lüderitzbucht, 71 metres (U.C.T.).

Distribution. Great Fish Bay, Angola (Thiele).

Remarks. Juveniles are almost subcircular, and not all full-grown shells are slightly obliquely oblong. The angularity of Sowerby's figure seems exaggerated.

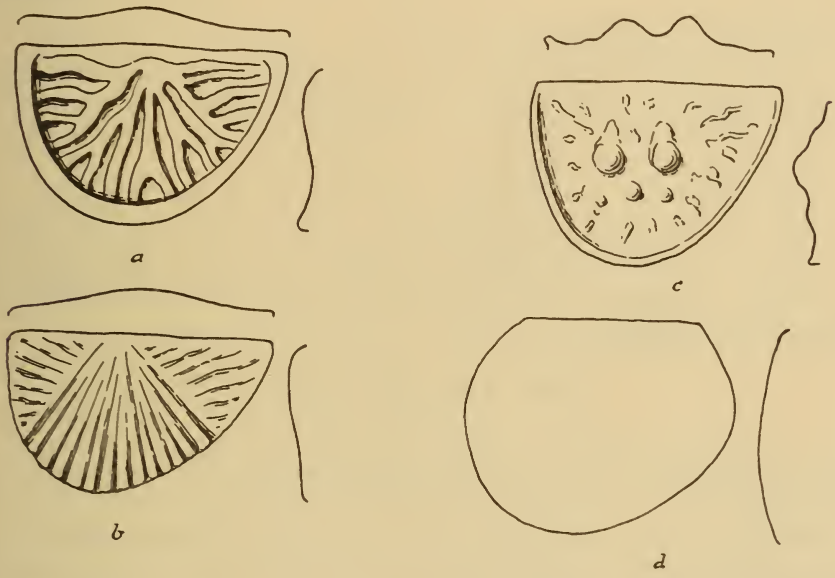


Fig. 5. Prodissoconchs, with longitudinal and transverse profiles, of: *a. Philobrya angulata* (Sow.). *b. smithi* nom. nov., *c. pileata* Thiele. *d. Hochstetterina velaini* (Smith).

Incubating examples were obtained by the P.F. off Cape St. Blaize, 125 fathoms, off Cape St. Francis, 70 fathoms; and by U.C.T. in False Bay and off Port Elizabeth.

Van Bruggen inserted in his map of the recorded localities 'Fish Bay' in its correct position: west of Cape St. Blaize; but the *Valdivia* locality was *Great* Fish Bay in Angola (*Valdivia* St. 81. 16° 25′ S., 11° 41′ E.).

Philobrya paramoea (Bartsch)

Hochstetteria paramoea Bartsch, 1915, p. 184, pl. 39, fig. 4.
Philobrya paramoea (Bartsch), Thiele, 1931, p. 191.

Port Alfred (Bartsch, Turton); Still Bay (S. Afr. Mus. coll. Muir).

34° 51′ S., 19° 37′ E., 80 metres; 35° 26′ S., 20° 56′ E. (Thiele).

Prodissoconch slightly domed in middle, radiately ribbed, with marginal rim.

Shell with 8–9 radial ribs, rounded, not slender as stated by Bartsch, nor sharp as his figure suggests.

Remarks. I am uncertain whether this is not a form or variation of *angulata*. The present material from Still Bay, and some Port Alfred valves received from Turton, are worn and do not show the radiating riblets on the prodissoconch very clearly, but they probably run in two directions as in *angulata*.

Philobrya pileata Thiele

Fig. 5 *c*

Philobrya pileata Thiele, 1931, p. 192, pl. 7(2), fig. 32.

Prodissoconch convex in middle, with 2 strong knobs, and smaller granules, and short more or less radial ridges, a narrow marginal rim.

Shell with 12–14 rounded radial ribs, slightly nodulose where crossed by the concentric lirae. 2·1 × 2·5 mm.

34° 51′ S., 19° 37′ E., 80 metres; 35° 16′ S., 22° 26′ E. (Thiele).

34° 5′ S., 25° 55′ E., 67 fathoms, 14 valves (S. Afr. Mus. P.F. coll.).

34° 48′ S., 23° 39′ E., 80 fathoms (U.C.T.).

Remarks. A species neatly characterized by its prodissoconch. The ribs on the shell are rounded as in *limoides*, not sharp as in *angulata*.

Philobrya smithi nom. nov.

Fig. 5 *b*

Hochstetteria limoides Smith, 1904a, p. 42, pl. 3, fig. 25; Bartsch, 1915, p. 184; Turton, 1932, p. 219.
Philobrya limoides Smith, 1904; Thiele in Thiele & Jaeckel, 1931, p. 191.

Prodissoconch 0·5 × 0·3 mm., with *c.* 12 radiating riblets in middle part, and 6–7 riblets curving upwards in anterior and posterior parts, riblets reaching the margin which has no raised rim.

Shell up to length 3, alt. 3·3 mm. (U.C.T.). Periostracum thin, pale brown.

Port Alfred (Smith, Bartsch, Turton); Still Bay (S. Afr. Mus. Muir coll.).

34° 51′ S., 19° 37′ E., 80 metres; 33° 50′ S., 25° 48′ E.; 35° 16′ S., 22° 26′E., 155 metres; 35° 26′ S., 20° 56′ E. (Thiele).

Many specimens from two stations in Algoa Bay, 67 and 124 fathoms; 2 valves from off Cape Infanta, 46 fathoms; 4 valves from East London area, 43 fathoms (S. Afr. Mus. P.F. coll.).

Living: False Bay, containing juveniles (U.C.T.); 34° 51′ S., 19° 55′ E., 22 metres (U.C.T.); west coast of Cape Peninsula (34° 11′ S., 18° 20′ E.), 15 fathoms (U.C.T.).

Remarks. Philobrya sp. juv. Thiele (1931, p. 193, pl. 7(2), fig. 34) may perhaps be a juvenile of this species; the shell has 7 ribs in the middle part, but the anterior and posterior parts are smooth. 1·5 × 1·6 mm. Off Table Bay, 178 metres, one valve (Thiele).

Philobrya africana Bartsch

Philobrya africana Bartsch, 1915, p. 185, pl. 46, figs. 1, 2; Thiele, 1931, p. 191; Turton, 1932, p. 219, pl. 56, no. 1527.
Philobrya africana var. *attenuata* Turton, 1932, p. 220, pl. 57, no. 1528.

Prodissoconch similar to that of *angulata*. Shell smooth. A thin, pale brown periostracum, slightly scarious along the later growth-lines, and overlapping the margin. Up to length 5, alt. 6·5 mm.

Port Alfred (Bartsch, Turton); Still Bay (S. Afr. Mus. Muir coll.).

34° 51′ S., 19° 37′ E., 80 metres; 35° 29′ S., 21° 2′ E., 102 metres; 35° 26′ S., 20° 56′ E. (Thiele).

Algoa Bay 67 fathoms, several valves; off Gericke Point (Knysna area) 46 fathoms, one valve (S. Afr. Mus. P.F. coll.).

West coast of Cape Peninsula (34° 11′ S., 18° 20′ E.), 15 fathoms (U.C.T.).

Hochstetterina velaini (Smith)

Fig. 5 *d*

Hochstetteria velaini Smith, 1904a, p. 42, pl. 3, fig. 24; Thiele, 1931, p. 189.
Hochstetteria decapitata Thiele, 1931, p. 189, pl. 6(1), fig. 30.
Hochstetteria kowiensis Turton, 1932, p. 219, pl. 56, no. 1524 (juv.).

Prodissoconch length 0·6, alt. 0·5 mm., smooth. Shell with thin brown periostracum. Length 4, alt. 4·75 mm.

Port Alfred (Smith, Bartsch, Turton).

Algoa Bay and Agulhas Bank, 80–155 metres (Thiele); 35° 16′ S., 22° 26′ E., 155 metres, one valve (*decapitata*) (Thiele).

Fairly abundant in the P.F. bottom-samples from off the Tugela River (Natal) to Algoa Bay, across Agulhas Bank, to False Bay, 22–124 fathoms; but only one valve was taken in False Bay (S. Afr. Mus. P.F. coll.).

33° 38′ S., 26° 54′ E., 30 metres, living, containing juveniles; also Algoa Bay, 15–46 fathoms, Plettenberg Bay, 5–60 fathoms, and 34° 51′ S., 23° 41′ E., 100 fathoms (U.C.T.).

Distribution. Great Fish Bay, Angola (Thiele).

Remarks. The shape varies somewhat. The length may equal the altitude, or occasionally may slightly exceed it (this may perhaps be due to wear). Older examples tend to be more oblique than younger ones. The prominence of the umbones also varies; and a very slight tilting of the shell can alter the appearance. The crenulation of the margin may be complete, or it may be interrupted in one or more places, especially in dead and worn shells.

Thus the present material (over 150 specimens) casts doubt on the validity of *decapitata*, which was based on a single valve.

Complete (bivalve) examples were taken by the P.F. off Cape Natal, 54 fathoms (7 examples); off Tugela River, 65–80 fathoms (2); off Cape St. Blaize, 125 fathoms (2); and East London area 43 fathoms (one).

Fam. **Mytilidae**

Jukes-Browne, 1905; Soot-Ryen, 1955.

Perna perna (Linn.)

Mytilus perna (Linn.), Krauss, 1848, p. 23; Jukes-Browne, 1905, p. 218; Lamy, 1931, p. 305; 1936, p. 130; Stephenson *et al.*, 1938, p. 12, pl. 3; Eyre & Stephenson, 1938, p. 35; Braga, 1952, p. 100, pl. 9, fig. 4.

Mytilus elongatus Lam., Fritsch, 1868, p. 74.

White line below the ligament (resilial ridge) pitted. No anterior adductor; anterior retractor byssi long oval, far forward; posterior retractor byssi divided, forming two separate scars. Hinge with 2 teeth in right, one in left valve (or vice versa).

Length up to 170 mm. (Thiele: Great Fish Bay).

Fossil: Pleistocene, Durban (Geol. Surv. S. Afr.).

Natal (Krauss). False Bay, Still Bay, Mossel Bay, Durban, Delagoa Bay (S. Afr. Mus.). Delagoa Bay (Braga; also U.W.). False Bay, Still Bay, Knysna, Port Elizabeth, East London, Isipingo, Durban, Kosi Bay, Inhambane (U.C.T.).

Walvis Bay (Lamy); Swakopmund (S. Afr. Mus.); Lüderitzbucht (U.C.T.).

Distribution. Red Sea, Aden, Madagascar, Mediterranean, north-west and west coast of Africa as far south as Great Fish Bay. Straits of Magellan, Brazil.

Remarks. The only South African Mytilid with a pitted resilial ridge.

Isolated examples have been found on the west coast of the Cape Peninsula, and at Ysterfontein (between Table Bay and Saldanha Bay) (U.C.T.).

† *Mytilus tomlini* Haughton, 1926, may be synonymous. See: Barnard 1962b, p. 183.

Chloromytilus meridionalis (Krss.)

Mytilus meridionalis Krauss, 1848, p. 21, pl. 2, fig. 7; Johnson, 1904, p. 9; Jukes-Browne, 1905, p. 218; Swart, 1926, p. 275, text-figs. 1–3; Lamy, 1931, p. 305.

Mytilus chorus f. *meridionalis* Lamy, 1936, p. 144.

Mytilus edulis (*non* Linn.), Krige, 1933, pp. 51, 52.

Not *Mytilus meridionalis* Smith, 1885, nom. preocc. See *Philobrya* (*Limopsidae*).

No pits on the white line below ligament (resilial ridge). No anterior adductor. Posterior retractor byssi scars continuous. Hinge with one tooth (right or left valve) fitting between 2 teeth on opposite valve, or sometimes 2 teeth in both valves. Caecum containing crystalline style very long.

Length up to 114 mm. (Krauss: 4½ in.).

Fossil: Post Pliocene; Inhambane (Cox, 1939); Pleistocene; Durban (Krige) (sed?), Sedgefield near Knysna (A. R. H. Martin).

East and west coasts, Elim (Bredasdorp Division) (Krauss); Port Elizabeth (Sowerby); Natal and Port Alfred (Bartsch, Turton); Saldanha Bay, Dassen Island, Table Bay, False Bay, Still Bay (S. Afr. Mus.); Lüderitzbucht, Port Nolloth, Lamberts Bay and Olifants River (west coast), False Bay and Hermanus (U.C.T.); Walvis Bay (Lamy); Beira (Lamy).

Remarks. If the extreme localities (Lamy) are accepted, this species extends all around southern Africa from Walvis Bay to Beira. There is, however, only one record from Natal (Bartsch) and no great reliance can be placed on the provenance of that specimen. Krauss gave east and west coasts, but mentioned only one locality (Elim) on the south coast *east* of Cape Point. U.C.T. has not found it at any locality east of Hermanus; nor has U.W. found it at Delagoa Bay.

The Beira record therefore should be regarded as due to some error in labelling; and Port Alfred taken as the extreme easterly limit of this species. Apparently it has not been taken *living* in any locality east of Hermanus.

Krige's fossil material should be re-examined. Material submitted to me by the Geological Survey South Africa (1958) contained only *perna*. Cox's 1939 material might also be re-examined.

Gen. SEMIMYTILUS Soot-Ryen

Soot-Ryen, 1955, p. 25.

White line (resilial ridge) below ligament not pitted. Anterior adductor present. Anterior retractor elongate, divided into two. Posterior retractor (foot and byssus) continuous. Hinge without any teeth. Lunule small, circumscribed by a fine line.

The only species is *algosus* (Gould) from the west coast of South America (Ecuador to Chile) and Juan Fernandez Islands. See Soot-Ryen, 1955, p. 25, pl. 4, fig. 17, text-figs. 8, 9, 14, 15, 16. A specimen 28 mm. long is figured.

Specimens collected by U.C.T. at Cape Cross, South West Africa, July 1957, undoubtedly belong to this genus. Soot-Ryen's description of *algosus* defined the genus but disclosed no characters which might serve as specific differences between the South American and the present specimens. They may be conspecific. *Aulacomya* has an analogous distribution.

Aulacomya magellanica (Chemn.)

Mytilus magellanicus Chemnitz, 1785, p. 164, pl. 83, figs. 742, 743; Lamy, 1936, p. 147.
Mytilus crenatus Lamarck, 1819, p. 38; Krauss, 1848, p. 24.
Mytilus capensis Dunker, 1846, p. 108 (= juv.); Lamy, 1936, pp. 147, 149.
Aulacomya magellanicus Jukes-Browne, 1905, p. 218; Thiele, 1931, p. 169.
Aulacomya ater Soot-Ryen, 1955, p. 33.

No pits on resilial ridge. No anterior adductor, except in juveniles; anterior retractor byssi elongate; posterior retractor byssi scars continuous, but the muscles divided into 3 bands; posterior retractor pedis slender. Hinge with a toothlike projection in left valve fitting into a depression on right valve.

Length up to 82 mm.

Table Bay, Saldanha Bay (Krauss); Port Elizabeth and Natal (Sowerby); Port Alfred (Turton); Swakopmund, Saldanha Bay, Dassen Island, Table Bay, False Bay, Still Bay (S. Afr. Mus.); Lüderitzbucht, Port Nolloth, Lamberts Bay, Saldanha Bay, False Bay, Hermanus, and Mossel Bay (U.C.T.).

Distribution. Straits of Magellan; Falkland Islands; Kerguelen Island.

Gen. Modiolus Linn.

Shell typically smooth, lunule dull. Hinge-line and margins not crenulate. Anterior adductor scar elongate, placed ventrally; posterior retractor and adductor scars continuous.

Modiolus auriculatus Krss.

Fig. 6 *c*, *d*

Modiola auriculatus Krauss, 1848, p. 20, pl. 2, fig. 4; von Martens, 1880, p. 318; Smith, 1891, p. 340; Odhner, 1919, p. 25; Dautzenberg, 1929, p. 572; Turton, 1932, p. 228; Lamy, 1936, p. 289.

Tapes [*sic*] *auriculata* (Krss.), Schwarz, 1910, p. 116.

The shape varies; individuals cramped for growing space become very short and deep. Periostracum hairs simple, filiform.

Length up to 53 mm.

Fossil: Pleistocene; Port Elizabeth (Schwarz).

Natal (Krauss); Port Alfred (dead) (Bartsch, Turton); Inyoni Rocks, Amanzimtoti, Natal (U.C.T.); Inhambane (U.C.T.); Mozambique Island (S. Afr. Mus. coll. K.H.B.).

Distribution. Red Sea, Suez, Persian Gulf, Seychelles, Diego Garcia, Anjouan Islands, Europa Island, Madagascar, Mauritius.

Remarks. Shells transitional between *auriculatus* and *philippinarum* have been recorded (Lamy, 1936, p. 287).

Modiolus sirahensis Jouss.

Fig. 6 *b*

Modiola rhomboidea Hanley [*ined.*] Clessin, 1889, p. 103, pl. 26, fig. 10; Sowerby, 1904, p. 3; Lynge, 1909, p. 130.

Modiola rhomboidea Reeve (*non* Hanley), Tomlin, 1923, p. 51.

Modiola sirahensis Jousseaume, 1891, p. 222; Lamy, 1937, p. 325.

One specimen, 40 × 16 mm., is quite fresh and was probably taken alive. The hind end is obliquely truncate, the hind margin very slightly concave. The growth-lines indicate that even when the shell was only 10 mm. long, the hind margin was obliquely truncate. The hinge-line is approximately three-quarters of the total length.

Off Tugela River (Natal), 25 fathoms (Sowerby, P.F. coll.) (S. Afr. Mus. No. A5393).

Distribution. Red Sea, Persian Gulf, Gulf of Siam, China, Japan.

Remarks. Sowerby in 1904, and on the label attached to the specimen, attributed the species to Hanley; Tomlin attributed it to Reeve. Lamy (1937, pp. 321 and 325) regarded *rhomboidea* Rve. as a synonym of the West African *stultorum* Jouss., and *rhomboidea* Hanley as a synonym of the Indo-Pacific *sirahensis* Jouss. As the South African specimens are far more likely to be the latter species, I follow Sowerby in identifying them as *rhomboidea* of Hanley, and figured by Clessin, for which Lamy adopted Jousseaume's name.

Modiolus philippinarum Hanley

Fig. 6 *a*

Modiola philippinarum Hanley, 1844, p. 15; 1845, p. 235, pl. 24, fig. 26; Odhner, 1919, pp. 6, 25; Dautzenberg, 1929, p. 572; Prashad, 1932, p. 72, pl. 2, figs. 25, 26; Lamy, 1936, p. 284; Cox, 1939, p. 73, pl. 1, fig. 6; Braga, 1952, p. 101, pl. 8, fig. 3; Macnae & Kalk, 1958, pp. 43, 129, fig. 23*d*.

Modiola lignea (*non* Reeve), Sowerby, 1892, p. 64; Johnson, 1904, p. 11; Bartsch, 1915, p. 189; Turton, 1932, p. 227.

A large specimen identified by Tomlin: greatest length 87 mm., hinge-line c. 44 mm.

More oblique than *sirahensis*, especially when old; hind margin convex, hinge-line approximately one half the total length.

Fossil: Miocene, Inhambane (Cox); Pleistocene, Port Elizabeth (Johnson) (sed?).

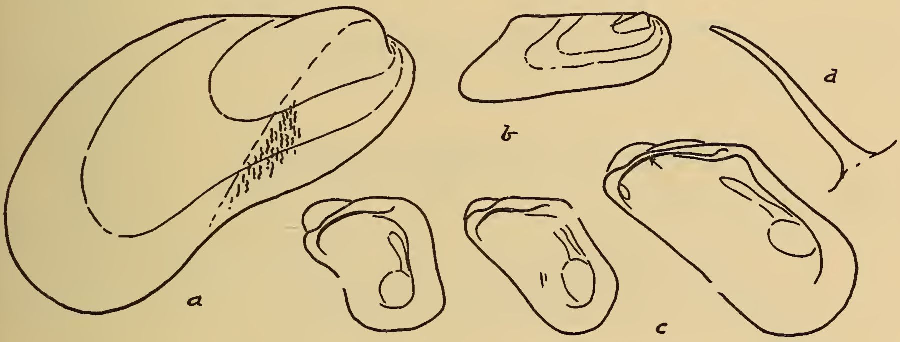


FIG. 6. *a*, *Modiolus philippinarum* Hanley. *b*, *M. sirahensis* Jouss. *c*, *M. auriculatus* Krss., three variations in shape (arrow in largest shell points to position of anterior retractor scar). *d*, periostracum hair.

Natal (sed?) juveniles 14–30 mm. (S. Afr. Mus.); Delagoa Bay (S. Afr. Mus. adult coll. K.H.B.; also Braga; also U.W.).

Distribution. Red Sea, Madagascar, Indo-Pacific.

Remarks. Juvenile shells, 11 mm. long, from 33° 03′ S., 27° 55′ E., 27 metres (U.C.T.), and 4–5 mm. long from False Bay (U.C.T.) correspond in shape with the growth-lines on the larger juveniles (14–30 mm.) and the adult specimen recorded above. They are glossy bright brown in colour.

Sowerby (1892), Johnson, Bartsch, and Turton recorded the Australian *lignea* Rve. from Port Elizabeth and Port Alfred. The 'dark brown, very shiny shells' (Turton) are more likely to be the juveniles of *philippinarum*.

Septifer bilocularis (Linn.)

Fig. 7 *a*, *b*

Tichogonia kraussi (Kien.), Krauss, 1848, p. 26.
Septifer kraussii (Kien.), Turton, 1932, p. 227.
Septifer nicobaricus Sowerby, 1897, p. 27.

Septifer bilocularis (Linn.), Odhner, 1917, p. 18, figs. 1, 2; Prashad, 1932, p. 69, pl. 2, figs. 21–24 (references); Lamy, 1936, p. 240 (references); van Bruggen, 1952, p. 13; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, pp. 34, 36, 129.
Modiola subtriangularis Turton, 1932, p. 228, pl. 59, no. 1592 (= juv.).

Fossil: Post Pliocene, Inhambane (Cox, 1939); Pleistocene, Durban (Geol. Surv. S. Afr.).

Off Umkomaas (Natal), 40 fathoms, several juv. valves 4–7 mm.; off O'Neil Peak (Zululand) 55 fathoms, 1 juv. valve (S. Afr. Mus. P.F. coll.)

Jeffrey's Bay (dead) (van Bruggen); Port Alfred (dead) (Turton).

Living: Port Elizabeth (S. Afr. Mus. R. Kilburn coll.); Durban and Umpangazi (U.C.T.); Delagoa Bay (U.W.); Inhambane (U.C.T.).

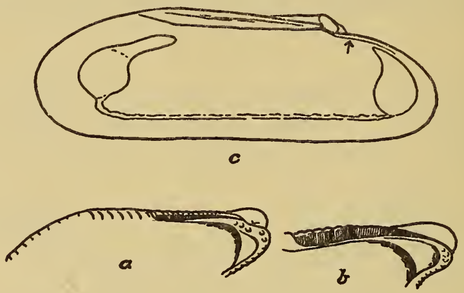


Fig. 7. *a*, *b*, *Septifer bilocularis* (Linn.), hinge of left valve of juvenile (total length 5 mm.) and of adult. *c*, *Adipicola pelagica* (Forbes, Woodward).

Distribution. Red Sea, Madagascar, Indo-Pacific.

Remarks. Turton's photo of the interior of no. 1592 shows distinctly the internal shelf not retouched (as is the hinge-line).

Specimens occur in which the margin of the septum is evenly curved, others in which there is a slight notch (cf. Odhner, fig. 2 *b*, *c*).

Gen. Brachidontes Swainson

(emend. *Brachyodontes* Agassiz, *Brachydontes* Gray).

Stephenson (1947, pp. 267, 268) mentioned a small purplish-black mussel common in Natal and referred to in previous papers as *variabilis* and as *capensis*. He said (p. 268) that '. . . two forms are figured by Krauss . . . , and it is very difficult to make out from the figures which of them applies to the Natal species —*there is little difference between them in any case*' [italics mine]. He identified the Natal specimens with the figure of *variabilis*, whereas Tomlin preferred to identify them with the *capensis* figure.

Surely (*pace* Stephenson and Tomlin) Krauss's two figures clearly show entirely different species. There is no difficulty in separating the typical form of *variabilis* from *capensis*. There is, however, some doubt as to the correct interpretation of Krauss's figure of the var. *semistriata* (*v. infra*).

Brachidontes variabilis (Krss.)

Fig. 8 *a–c*

Mytilus variabilis Krauss, 1848, p. 25, pl. 2, fig. 5; Bartsch, 1915, p. 188; Turton, 1932, p. 226.
Brachidontes variabilis (Krss.), Tomlin, 1927, pp. 302, 320; Prashad, 1932, p. 66; Lamy, 1936, p. 176; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, pp. 118, 129.
Brachidontes capensis (*non* Krauss), Eyre & Stephenson, 1938, p. 35.

Shape mytiloid, umbones terminal; obliquely oblong, ventral margin more or less concave, hind margin rounded or sometimes subtruncate; radiating riblets from dorsal margin to middle of ventral margin, none on anterior part; ligament groove broadening posteriorly and ending abruptly, its dorsal margin crenulate, behind it a few denticulations or strong crenulations, followed by crenulations which continue around margin except antero-ventrally; right valve with a notch below umbo, left valve with a tooth, in both valves a few inconspicuous denticles below on anterior margin.

Anterior adductor placed ventrally, scar partly concealed by the shell margin, posterior retractor byssi strong, forming a single scar joined dorsally to the posterior adductor, and sometimes exceeding the latter in size.

Length 19–20 mm.

Brownish or blackish, more or less purplish, internally violaceous.

Table Bay and Natal (Krauss); Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); Umkomaas (Natal) (S. Afr. Mus. coll. Burnup); Delagoa Bay and Mozambique Island (S. Afr. Mus. coll. K.H.B.).

East London, The Haven, Umtwalumi, Umkomaas, Isipingo, Durban Umhlali, Richards Bay, Umpangazi, St. Lucia Bay, Kosi Bay (U.C.T.).

Distribution. Red Sea, Suez, Karachi, Seychelles, Madagascar, Rodriguez, East Indies.

Remarks. Krauss seems to have erred in giving Table Bay as a locality. It has not been confirmed by recent collecting, nor in fact has the species been found anywhere on the west coast of South Africa. Farther north, however, it is represented by the very similar *puniceus* (Gmelin) = *senegalensis* (Lam.). Prashad was of opinion that *variabilis* was quite distinct from the latter species, but did not state any differential characters.

Var. *semistriata* Krss.

Mytilus variabilis var. *semistriata* Krauss, 1848, p. 26, pl. 2, fig. 6; ? Turton, 1932, p. 226.
[?] *Mytilus variabilis* var. *striata* [*err.*] Bartsch, 1915, p. 188.

Krauss said that in Natal there were transitions from typical *variabilis* to a variety which he called *semistriata*, having radiating riblets *only below* the umbonal ridge to the middle of the ventral margin. In old and worn shells, however, the riblets on the dorsal area are often feeble and obscure.

Two other, more serious, comments are required on Krauss's figure 6 of the variety. The ligament groove is shown narrower than in figure 5 of the typical form. This may be due to perspective, the full width of the groove often not being seen unless the ventral margin of the shell is tilted up. Assuming,

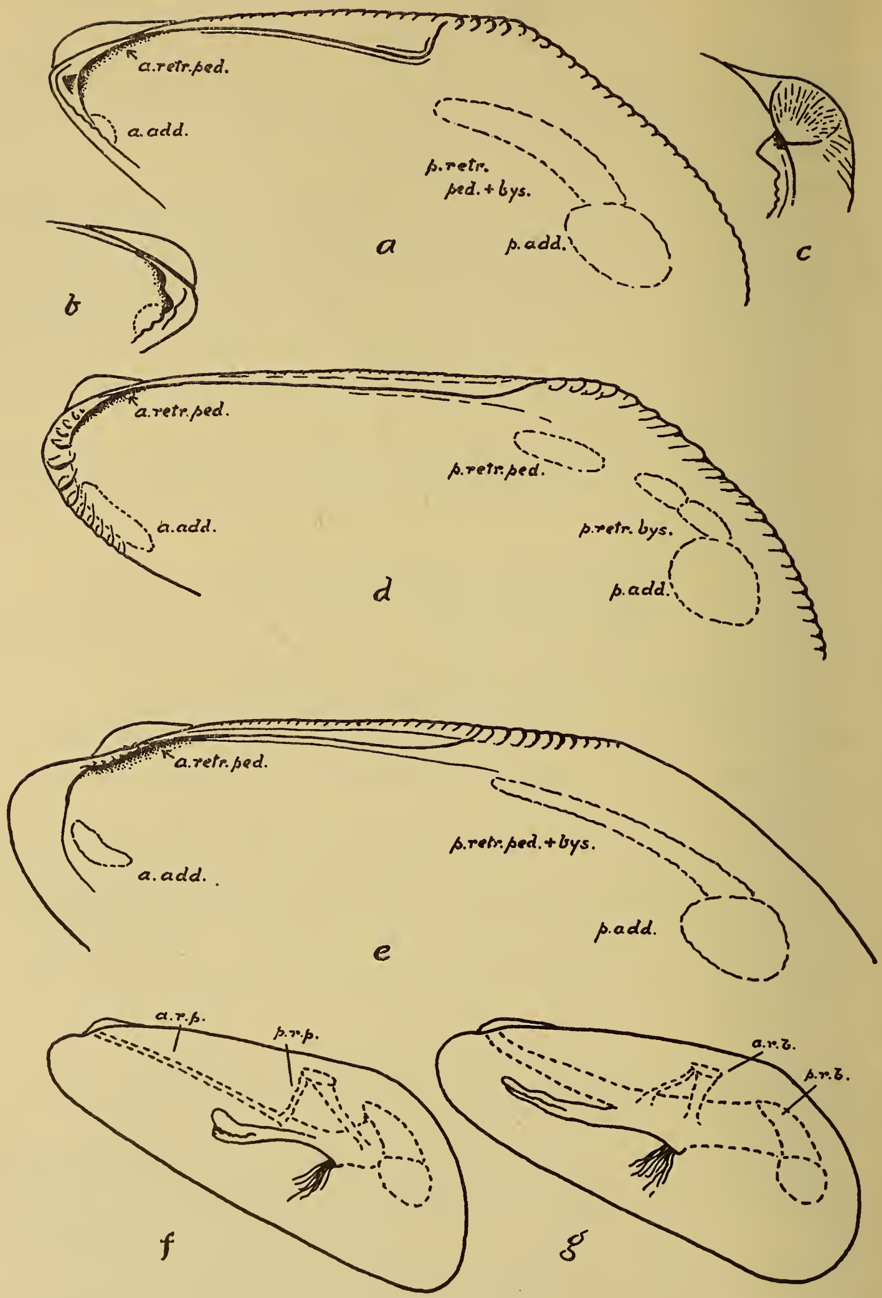


Fig. 8. *Brachidontes variabilis* (Krss.). *a*, right valve. *b*, apex of left valve. *c*, apical view of left valve. *d*, *Musculus virgiliae* n.sp. *e*, *Lamya capensis* (Krss.). *f*, *g*, *Lamya capensis*, pedal and byssal muscles in retracted and extended positions (semidiagrammatic).

however, that the full width of the groove was portrayed in both figure 5 and figure 6 by the artist, the difference is noticeable.

The second comment concerns the hinge under the umbo, and the anterior margin. This detail is not as clear as could be desired either in figure 5 or in figure 6; but figure 5 (right valve) seems to show a hollow and 2 denticles, as is found in the present specimens. Figure 6, however, shows a different hinge: a series of denticles from below, or slightly behind, the umbo, continued around the anterior margin.

Nevertheless the umbo is shown as terminal, as in the typical form, and definitely not subterminal as in figure 3 of *capensis*.

I have seen no specimens with the 'semistriate' sculpture; and suggest that a re-examination of Krauss's material would be useful.

Specimens of *B. karachiensis* Melv. & Standen (1906, p. 800, pl. 54, fig. 8) might perhaps be compared; neither the description nor the figure are adequate.

Gen. LAMYA Soot-Ryen

Soot-Ryen, 1958, p. 342; 1963, p. 127.

Modioliform, umbones subterminal; hinge-line denticulate, the denticulations extending behind the ligament; a slight denticulate callus below the umbo, anterior margin without denticles.

Anterior adductor scar placed about midway between umbo and ventral margin, anterior retractor scar round, in the umbonal cavity. The scar of the posterior retractor is contiguous posteriorly with that of the posterior adductor, and narrows anteriorly to below about the hind two-thirds of the hinge. The posterior retractor byssi, however, is divided into a slender anterior branch and the main posterior portion contiguous with the posterior adductor (contrast *Lanistina*); the slender posterior retractor pedis is attached contiguous with the anterior branch of the posterior retractor byssi.

Mantle margin of branchial cavity papillose; gonads entering the mantle.

In 1963 Soot-Ryen thought that *Lamya* might prove to be a synonym of *Arcuatula* Lamy 1919.

Lamya capensis (Krss.)

Fig. 8 *e–g*

Modiola capensis Krauss, 1848, p. 20, pl. 2, fig. 3; Schwartz, 1910, p. 116; Bartsch, 1915, p. 189; Turton, 1932, p. 227; Scott, Harrison & Macnae, 1952, pp. 301, 302, 306, 309 (habitat); Day, Millard & Harrison, 1952, pp. 395–398 (habitat).

Modiola tenerrima Smith, 1904a, p. 42, pl. 3, fig. 26; Bartsch, 1915, p. 188; Turton, 1932, p. 227; Lamy, 1937, p. 346.

Volsella capensis (Krss.), Day & Morgans, 1956, p. 308.

Lamya capensis (Krss.), Soot-Ryen, 1958, p. 342, 2 text-figs; Barnard, 1962b, p. 183.

[*Non*] *Mytilus capensis* Dnkr. (= *magellanicus*).
Brachidontes capensis Eyre & Stephenson 1938 (= *variabilis*).
Brachidontes capensis from St. James and Arniston, Stephenson, 1948 (= *Gregariella simplicifilis*).
Modiola capensis Day, Millard & Broekhuysen, 1954, and Broekhuysen & Taylor, 1959 (= *Musculus virgiliae*).

Obliquely oblong, ventral margin straight or slightly concave, sometimes distinctly concave; surface smooth, occasionally a few weak and obscure riblets anteriorly; a slight, feebly denticulate callus below umbo; hinge-line with crenulations which continue a short distance behind the ligament (feeble and obscure in some large specimens); rest of margin not crenulate (except feebly so anteriorly when riblets are developed).

Corneous-olivaceous, usually with concentric undulating reddish cross-bars, and radiating reddish streaks from umbo to hind margin; internally the reddish cross-bars are more conspicuous.

Up to 76 × 30 × 20 mm. (Still Bay); 67 × 28·2 × 16·4 mm. (Soot-Ryen: Zwartkops estuary); 10·3 × 5·5 × 3·3 Par. lines (Krauss: Knysna).

Fossil: Pleistocene, Port Elizabeth (Schwarz) ? (not seen by me); Sedgefield near Knysna (A. R. H. Martin).

Klein River estuary, Hermanus (U.C.T.); Breede River mouth (U.C.T.); Still Bay lagoon (Miss Wapenaar, U.C.T.); Knysna River (Krauss); Knysna lagoon (S. Afr. Mus. P.F. coll.); Knysna lagoon, dredged in 3–5 metres (U.C.T.); Keurbooms River estuary (Provincial Inland Fisheries Dept.); Zwartkops River estuary, Port Elizabeth (Soot-Ryen; coll. Macnae); Bushman's River, 18 miles from mouth (U.C.T.); Port Alfred (Smith, Bartsch, Turton); Buffalo River, 2 miles above jetty (S. Afr. Mus. P.F. coll.); Port St. Johns, on piles of footbridge, western estuary (U.C.T.); Salisbury Island, Durban Bay, floating jetty (U.C.T.); Inhambane (U.C.T.).

Remarks. Bartsch recorded one specimen taken by Stimpson in 1853 in Simon's Bay (False Bay). This species has not been recorded from the sea, nor from any locality west of Hermanus. There is no river or lagoon at Simonstown; the nearest suitable estuary or lagoon is Muizenberg Vlei; but neither South African Museum nor U.C.T. has found it there. Presumably therefore some error in labelling has occurred; or perhaps Bartsch misidentified the specimen.

I have examined the U.C.T. material collected by Prof. T. A. Stephenson and his assistants; some of the specimens recorded by these authors had been misidentified (*v. supra*).

I have little doubt that Smith's *tenerrima* is synonymous; and Soot-Ryen was inclined to regard it as such pending examination of the animal. Re-examination of the Type shell should suffice to settle the question.

Up to the present very large specimens have been found at only two localities: Zwartkops estuary by Dr. Macnae in 1950, and more recently (1960) in the Still Bay lagoon by Miss Wapenaar (U.C.T.). The latter are the largest known specimens. At Knysna shells up to 25 mm. long occur, and up to 30 mm. in the Bushmans River and Klein River estuary.

Undulating reddish cross-bars occur in this species, and also in *Musculus virgiliae* and in *Lanistina cuneata*; but *capensis* is the only South African species which has *radiating* colour streaks.

The anatomy of Knysna specimens (not in very good condition) appears to correspond with that of the large Zwartkops (Soot-Ryen) and Still Bay examples.

Musculus (*Musculus*) *virgiliae* n.sp.

Fig. 8 *d*

Modiola capensis (*non* Krauss), Day, Millard & Broekhuysen, 1954, pp. 143, 153; Broekhuysen & Taylor, 1959, pp. 284, 285, 292.

Obliquely oblong, dorsal margin straight, ventral margin concave, umbones subterminal; hinge-line straight, obscurely crenulate along whole length, or anterior part, of ligament, which is narrow and close to dorsal margin; denticulations or strong crenulations beginning behind ligament, and continued as weaker crenulations around margin as far as the non-ribbed area on ventral margin; anterior margin with 6–8 conspicuous denticles, one or two of them larger than the others, followed by crenulations extending to the non-ribbed area.

Radiating riblets 7–9, not very strong, on anterior area, numerous and well developed on posterior area, a smooth intervening area; towards the margins new riblets are interpolated, the old ones not bifurcating. At shell length 2 mm. anterior riblets 4–5, posterior *c.* 25; at 4 mm. anterior 5, posterior *c.* 28–32; at 10 mm. anterior 6–7, posterior *c.* 35–38.

Anterior adductor scar elongate-oval, near antero-ventral margin; anterior retractor under the umbo; posterior retractors usually with 3 branches, not extending forwards under the ligament, continuous with the well-developed posterior adductors.

Margin of upper siphon smooth, of branchial opening papillose.

Length 17–19 mm. Dark olivaceous or coppery brown, sometimes grass-green, juveniles paler, with transverse reddish wavy bars on the posterior part, interior violaceous, the cross-bars sometimes showing faintly.

Great Brak River (Mossel Bay), 4 miles from mouth (U.C.T.); Knysna lagoon, under stones just above low water (U.C.T.); Keurbooms River, on water-logged wood, 5 miles from mouth (S. Afr. Mus. coll. K.H.B.) (Types); Zwartkops River, Redhouse, Port Elizabeth (S. Afr. Mus.); Bushmans River, 18 miles from mouth (U.C.T.); The Haven (Bashee River mouth) ½ mile up Mbanyana River (U.C.T.); Port St. Johns, piles of footbridge, western estuary (U.C.T.); Amanzimtoti lagoon (Natal) (U.C.T.); Umzimbezi River mouth (U.C.T.); Illovo (S. Afr. Mus.); Amahlongwana lagoon (near Scottburgh) (S. Afr. Mus. coll. Burnup); St. Lucia Bay and Kosi Bay (U.C.T.); Lagoa Poelela, Inhambane (U.C.T.).

Type material South African Museum no. A7776.

Remarks. The specimens described above seem to belong to a distinct species. Externally they closely resemble B. *variabilis*, and have been identified as such. They have also been identified as *L. capensis*, with less justification because the latter is a smooth species.

Bearing in mind the comments given above concerning var. *semistriata*, is it possible to identify the present series of specimens with Krauss's variety?

Krauss referred to the absence of riblets on the dorso-posterior part of the shell, but here it is precisely this area which is always clearly ribbed. And in Krauss's figure the umbo is terminal.

For these reasons I consider these specimens should be given a specific name. *Virgilia*: the botanical name of the Keurboom tree.

Musculus difficilis (Desh.)

Fig. 9 *a–c*

Modiola difficilis Deshayes, 1863, p. 23, pl. 3, figs. 22–24 [Odhner quoted: pl. 3; Dautzenberg: pl. 30]; Odhner, 1919, p. 6; Dautzenberg, 1929, p. 573.
Modiolaria difficilis (Desh.), Lamy, 1937, p. 36.
Modiolaria africana Bartsch, 1915, p. 190, pl. 41, fig. 2; Braga, 1952, p. 102.

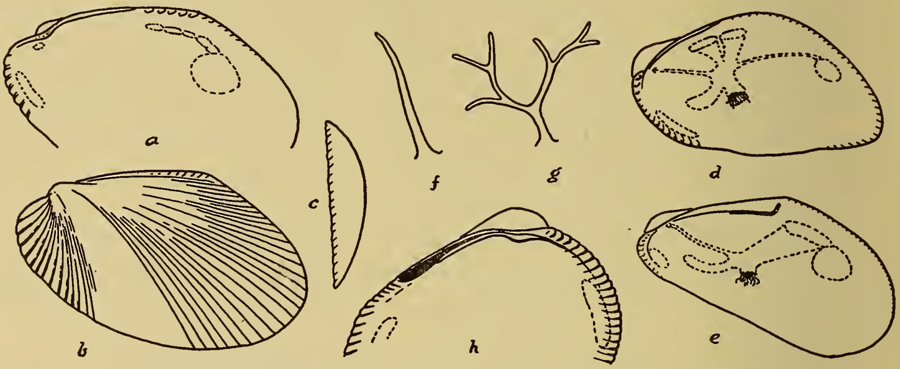


Fig. 9. *a, b, c, Musculus difficilis* (Desh.), internal, external, and end view of one valve. *d, Lanistina cuneata* (Gould). *e, f, Gregariella simplicifilis* n.sp., internal view and periostracum hair. *g, Gregariella* sp., periostracum hair. *h, Crenella striatissima* Sow.

Posterior ribbed area crenulated by the growth-lines. 3·5 × 2 mm. (Bartsch); 5 × 3·5 mm. (Braga); 13 × 6 mm. (Odhner); Port Alfred (dead) (Bartsch); Inhambane (Braga).

Distribution. Réunion (Deshayes); Madagascar (Odhner).

Remarks. Odhner mentioned minor differences in his material; but did not give the number of riblets.

A single flat and ovoid shell may be *difficilis* as it is similar in form to *africana*; but the posterior riblets are fewer (26 instead of 50), and are not crenulate, the growth-lines being very fine. The posterior retractor muscles are as in *Musculus* s. str.

7·5 × 4·5 × (2 valves together) 2·3 mm. Corneous, with irregular, wavy reddish cross-bars.

Delagoa Bay (S. Afr. Mus. coll. K.H.B.).

'Musculus' *ima* (Bartsch)

Modiolaria ima Bartsch, 1915, p. 190, pl. 41, figs. 4, 5; Turton, 1932, p. 228.

Seems to be distinguished by having fewer riblets; but a doubtful species.

Two valves in South African Museum (pres. Turton) have at shell length 2·25 mm. anterior 3, posterior 11 riblets; at 3·25 mm. 4 and 14 resp.; Bartsch gave 4 and 16 at 7 mm. length.

Gen. LANISTINA Gray

Anterior adductor stronger than posterior adductor. Posterior retractor divided into a strong elongate anterior portion attached to the shell *beneath the ligament*, and a slender posterior branch contiguous with the posterior adductor.

Soot-Ryen (1955) considered that certain species (e.g. *marmoratus*) should be separated from *Musculus* s. str. on account of the posterior retractor; and suggested adopting *Lanistina* Gray 1847 in preference to *Modiolarca* Gray 1843 (the latter being possibly a misprint for *Modiolaria*).

Lanistina cuneata (Gould)

Fig. 9 *d*

Modiolaria cuneata Gould, 1861, p. 38; Smith, 1885, p. 278, pl. 16, figs. 7, 7*a*; 1891, pp. 393, 394 (synonymy discussed); Bartsch, 1915, p. 189, pl. 42, figs. 5, 6; Turton, 1932, p. 228.
Musculus cuneatus (Gould), Prashad, 1932, p. 75, pl. 2, figs. 34, 35.
Modiolaria discors (*non* Linn.), Sowerby, 1892, p. 64; Schwarz, 1910, p. 116.
Modiolaria marmorata (*non* Forbes), Sowerby, 1892, p. 65; Turton, 1932, p. 228.

At shell length 1·5 mm. anterior riblets 10, posterior 18; at 3–4 mm. 10 and 20; at 7–8 mm. 12–14 and 26–28; at 11 mm. 16 and 30–32 (numbers approximate); Bartsch's number '17' posterior riblets is too low, possibly a misprint for 27.

Valves strongly inflated, thickness (2 valves together 4·5 mm. at shell length 7 mm.; 6–7 mm. at 11 mm.

Yellowish olivaceous, often with pinkish or reddish mottling, irregular or forming more or less concentric wavy cross-bars.

Musculature as in *marmorata* (List, 1902).

Fossil: Pleistocene, Port Elizabeth (Schwarz); Quaternary, Sedgefield near Knysna (A. R. H. Martin).

Simon's Bay (False Bay), 'imbedded in test of large Ascidian' (Gould; also Smith); Port Alfred (Bartsch, Turton); False Bay to Tongaat (Natal) (S. Afr. Mus.).

Off Cove Rock (East London), 22 fathoms (S. Afr. Mus. P.F. coll.).

Saldanha Bay, amongst *Pyura*; Kalk Bay (False Bay) harbour piles; off Cape St. Blaize (34° 46′ S., 22° 05′ E.), 51 fathoms; Algoa Bay, 6–46 fathoms; Durban; Kosi Bay (Zululand); Inhambane (U.C.T.).

Distribution. Sydney, Australia, 6–15 fathoms (Smith, 1885); East Indies (Prashad).

Remarks. Smith (1891) was doubtful about *cuneata* being synonymous with *marmorata* (Forbes) from Europe, Mediterranean, Suez, Persian Gulf, and Canary Islands. In 1885 he said it was 'not quite so elongate' as *marmorata*, and suggested varietal rank for the former. Slight variations in shape and proportions are found in the present material, and do not seem important. After comparison with List's (1902) description and figures of shell and anatomy, I think *cuneata* should be regarded as a synonym, but *pro tem.* retain Gould's name.

The large Ascidian mentioned by Gould is the 6–8-inch-long *Pyura stolonifera*, locally known to fishermen as 'red bait'; several individuals usually grow close together in clumps, and the mollusca are found in the intervening crevices, and also embedded in the tests. List records *marmorata* as living free or embedded in the test of Ascidians, or even within the mantle cavity (1902, pl. 3, figs. 10, 12, 13, 14).

Gregariella simplicifilis n.sp.

Fig. 9 *e*, *f*

Modiola petagnae (*non* Scacchi), Sowerby, 1892, p. 64; Turton, 1932, p. 227.
Modiola petagnae var. *rietensis* Turton, 1932, p. 227, pl. 59, no. 1590.
Modiola rufanensis Turton, 1932, p. 227, pl. 59, no. 1591.
Modiola albanyana Turton, 1932, p. 229, pl. 59, no. 1600.
Brachidontes capensis (*non* Krauss), Stephenson, 1948, p. 268.

A few feeble and obscure riblets anteriorly; fine radial riblets on the umbonal ridge and slightly below it, usually more or less concealed by the simple, unbranched periostracal hairs. Dorsal margin crenulate, crenulations extending behind ligament, but petering out before reaching the ventral margin, anterior margin crenulate. Ligament widening posteriorly and ending abruptly (cf. *B. variabilis*).

Anterior retractor under the umbo, posterior retractor (pedis et byssi) compact, contiguous with posterior adductor, which is larger than the anterior adductor.

Up to 14 mm. long. Golden brown.

Gordon's Bay (False Bay) (no. 6878, Types), Hermanus, Still Bay, Mossel Bay (S. Afr. Mus.); St. James (False Bay) and Arniston (Stephenson); Plettenberg Bay; Inyoni Rocks, Amanzimtoti, Natal (U.C.T.).

Remarks. Soot-Ryen (1955, pp. 76, 77) suggested that *petagnae* Scacchi should be a synonym of *opifex* (Say), described originally from supposedly Mediterranean shells; and stated that this species has branched periostracal hairs.

Sowerby's identification of the common South African species with simple hairs therefore seems erroneous. A new specific name seems advisable to place the South African species on a definite footing, even though it may later have to be altered.

Gregariella sp.

Fig. 9 *g*

Deeper and more oval in shape than *simplicifilis*. Feeble riblets anteriorly, and fine radial riblets on the umbonal ridge, extending forwards to middle of ventral margin. Periostracal hairs branching dichotomously, those on the hind end nearly half the length of the shell. Dorsal and posterior margins more conspicuously crenulate than in *simplicifilis*, the crenulations extending to midway on ventral margin. Ligament not so broad as in *simplicifilis*. Muscle scars as in the latter species.

5·5 × 3 mm.

Off Umkomaas (Natal), 40 fathoms, one valve; off Umhloti River (Natal), 40 fathoms, one valve (S. Afr. Mus. nos. A9475, A9476, P.F. coll.).

Until further material is available, these valves are left indeterminate.

Crenella striatissima Sow.

Fig. 9 *h*

Crenella striatissima Sowerby, 1904, p. 3, pl. 6, fig. 1; Bartsch, 1915, p. 189; Thiele, 1931, p. 171; Turton, 1932, p. 228; Lamy, 1937, p. 58.
Crenella alfredensis Bartsch, 1915, p. 189, pl. 41, fig. 1; Turton, 1932, p. 228.
Crenella minuta Thiele, 1931, p. 171, pl. 6(1), fig. 5 (= juv.).

Length (i.e. alt.) 10, width (i.e. length) 8 mm. (Sowerby).

34° 7′ S., 25° 42′ E., 56 fathoms, one living (Type); off Umhloti River (Natal), 100 fathoms, one valve (fresh) cotype (Sowerby; P.F. coll.).

Off Cape Natal (Durban), 85 fathoms, 2 living; 34° 5′ S., 25° 55′ E., 67 fathoms, several valves; 34° 26′ S., 25° 42′ E., 124 fathoms, 8 valves; off Cape Morgan, 45 fathoms, several valves; off Umkomaas (Natal), 40 fathoms, several valves (S. Afr. Mus. P.F. coll.).

Port Alfred, dead (Bartsch, Turton).

33° 50′ S., 25° 48′ E.; 34° 8′ S., 24° 59′ E., 80 metres; 33° 41′ S., 18° 03′ E. (off Table Bay), 178 metres (Thiele).

Algoa Bay, 14 fathoms; and False Bay, 22 fathoms (U.C.T.).

Type and cotype in South African Museum no. 14855 and 14856 respectively.

Distribution. Great Fish Bay, Angola (Thiele).

Remarks. Thiele assigned a small (size not given) valve from 34° 51′ S., 19° 37′ E., 80 metres, to Sowerby's species. Nevertheless he described two valves from another locality (35° 29′ S., 21° 2·5′ E., 102 metres), one of them nearly circular (2·5 × 2·8 mm.), the other more egg-shaped, as a different species; without stating the differences. Shape, however, is not a differential character, because the growth-lines on larger shells show that the younger the shell the more circular its outline; and young shells may vary in this respect. Beach-wear, of course, may alter the appearance of the shell.

A worn and broken valve from off Cape St. Blaize, 125 fathoms (S. Afr. Mus. P.F. coll.), shows that the Type is by no means fully grown. Although the umbo and the part containing the anterior adductor scar are missing, the specimen is similarly striated and appears to be undoubtedly conspecific. Length 16, alt. *c.* 19 mm. (20 if the umbo were present).

Rhomboidella capensis Thiele

Rhomboidella capensis Thiele, 1931, p. 170, pl. 6(1), fig. 4.
Mytilus thalia Turton, 1932, p. 227, pl. 58, no. 1583; Lamy, 1936, p. 179.

Obliquely rhomboidal (approximately as in Thiele's figure, but slightly variable), thin, transparent; fine radial striae; growth-lines (or the main ones) rather widely spaced; margin internally crenulate.

Length 3, alt. 3·5 mm. (Thiele). 5 × 7 mm. (S. Afr. Mus.).

34° 51′ S., 19° 37′ E., 80 metres, one shell (Thiele).

St. Francis Bay, 24–34 fathoms, one living; 34° 26′ S., 25° 42′ E., 124 fathoms, 2 valves; off Cape Morgan, 77 fathoms, one valve; off Umkomaas (Natal), 40 fathoms, 2 valves; off Tugela River, 65–80 fathoms, 7 valves, fresh (semitransparent); off O'Neil Peak (Zululand) 90 fathoms, 2 living, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. Thanks to the kindness of Dr. Cain of the Oxford University Museum, I have been able to examine the Type of Turton's *Mytilus thalia.* It is rather narrow, compressed antero-posteriorly, and measures length 2·3, alt. 3·75 mm. In the *Pieter Faure* collection there are comparable specimens, e.g. the Cape Morgan valve, 2·5 × 4 mm., and the smaller of the two Umkomaas valves, 3 × 5·3 mm. The anterior margin can be straight (slightly convex in Thiele's figure), but usually shows a slight concavity, which is more clearly noticeable in the compressed valves, including the Type of *thalia.*

Of the three largest valves one comes from off O'Neil Peak, one from off Tugela River, and one from St. Francis Bay.

Thiele assigned a larger valve (umbo to lower corner 6 mm.) from East Africa as doubtfully belonging to *capensis.* As the species is found living off the Zululand coast, it may well be living farther north.

Adipicola pelagica (Forbes MS., Woodward)

Fig. 7 *c*

Modiolarca pelagica Forbes MS., Woodward, 1854, p. 266, pl. 17, fig. 6.
Myrina denhami Adams, H. & A., 1854, p. 76.
Myrina pelagica (Woodward), Adams, H. & A., 1857, p. 514, pl. 121, figs. 2, 2*a*, *b*.
Adula pelagica (Woodward), Tomlin, 1926, p. 299; Lamy, 1937, pp. 186, 190.
Adipicola pelagica (Woodward), Dautzenberg, 1927, p. 274, pl. 8, figs. 15, 16.

Prodissoconch distinct. Concentric growth-lines, but no radial striations. No trace of crenulations on margin of valve. Ligament wholly internal. Anterior adductor as large as posterior adductor; anterior retractor pedis + byssi high up under the margin and immediately in front of umbo; posterior retractor pedis + byssi contiguous with posterior adductor.

Margins of ventral opening of mantle papillose anteriorly and posteriorly; siphon not fringed.

17 × 5·5 (at umbo) 6 mm. (at end of ligament). Corneous brown, paler on umbonal region, prodissoconch chestnut-brown.

On floating whale blubber off the Cape (H.M.S. *Herald*).

Off Dassen Island (Table Bay), 240 fathoms, living in abundance on water-logged whale skull (S. Afr. Mus. coll. Eccles, 1963).

Distribution. 42° 50′ N., 28° 37′ W. on a lump of floating spermaceti; Azores, 1372–1846 metres (Dautzenberg).

Remarks. The specific name *denhami* appears to have been instituted by H. & A. Adams in 1854; and in the same year Woodward (1854, p. 266) used *pelagica*. These two papers are not available to me to settle the priority, but H. & A. Adams in 1857 (p. 514) adopted *pelagica*; and later authors (Dautzenberg 1927, Lamy 1937) have followed suit. It seems a pity if this species, collected during the cruise of H.M.S. *Herald* off the Cape in 1850–1, cannot bear the name of her commander Captain Denham.

Gen. LITHOPHAGA Röding

Lynge, 1909, p. 136; Prashad, 1932, p. 76; Iredale, 1939, p. 416; Soot-Ryen, 1955, p. 91; Turner & Boss, 1962.
Modiola cylindrica Krauss, 1848, p. 21, pl. 2, fig. 2; Turton, 1932, p. 227.
Modiola mucronata Phil., Krauss, 1848, p. 21.
Lithodomus lithophagus Linn., Macnae & Kalk, 1958, pp. 37, 92, 119, 129, fig. 23 *a*.

To the two species recorded by Krauss from Natal, *lithophagus* has recently been added from Inhaca Island, Delagoa Bay.

Turton's specimens from Port Alfred must have been dead shells because Madrepore corals die out at about Port St. Johns, considerably north of Port Alfred (Crossland & Stephenson, 1948, pp. 174, 178).

Tomlin identified specimens collected by U.C.T. from Umpangazi and Umtwalumi as *gracilis* (Phil.).

I have seen 3 specimens from Umtwalumi (U.C.T.) measuring 30 × 10, 46 × 16, and 66 × 17 mm. All vertically striated. The hinge-line is longer than the length of the shell behind it, and the length of the shell (umbo to posterior margin) makes an angle of 10°–12° with the line of the hinge. The shell is thus only slightly oblique, nearly cylindrical.

These shells are clearly referable to *cylindrica* Krss. This may be the same as *gracilis* (Phil.), which is regarded as a synonym of *teres* (Phil.) (see Lynge, p. 136; Prashad, p. 77).

At the same locality U.C.T. took another shell, 65 × 24 mm., without vertical striations and with a thin chalky incrustation, giving the shell a fretted appearance, and not extending beyond the valves. The shape is definitely oblique, the length making an angle of 22° with the line of the hinge. The hinge-line is shorter than the length of the shell behind it. This shell has the shape of *obesa* (Phil.) as figured by Iredale (1939, pl. 6, fig. 30). Iredale said the shape was distinctive.

L. obesa was recorded from Mozambique by Dunker, and from the Red Sea by Lamy. *L. nasuta* (Phil.) has also been recorded from Mozambique.

Some small specimens, the largest 18 × 9 mm., from corals at Inhaca Island, Delagoa Bay (coll. K.H.B. 1912) have a thin chalky incrustation not extending beyond the valves, and no vertical striations. The shape is very little oblique, and the hinge-line is a little more than half the total length. These specimens may perhaps be juvenile *obesa*.

Species inquirenda

Modiola pseudocapensis Lamy

Modiola pseudocapensis Lamy, 1931, p. 305; 1937, p. 312; Soot-Ryen, 1958, p. 341.

This species, the largest specimen of which measured 52·5 × 25 × 16 mm., was stated to resemble *Lamya capensis* externally. Do the words 'obscure radiatim striatum' mean *colour* streaks (as in *capensis*) or sculpture? In addition to this ambiguity, the words in the diagnosis 'post ligamentum margo cardinalis crenulatus' conflict with the statement that all the *pseudocapensis* shells had no crenulations, and the species was therefore a true *Modiolus*. The hinge and the muscle scars were not mentioned.

Soot-Ryen (1958, p. 341) said he had seen the Type, and that it belonged to a different group [not *Modiolus*]; he did not, however, state to what genus he considered it belonged.

Lamy's specimens were stated to have been collected at Beira and Walvis Bay.

Fam. **Isognomonotidae**

Prashad, 1932, pp. 81 and 88 (*Isognomoniidae* + *Vulsellidae*).
Thiele, 1935, p. 801. (*Vulsellidae*).
Iredale, 1939, p. 319 (*Isognomontidae*).
Kira, 1955, p. 91 (*Isognomonidae*).

The following key combines the generic diagnoses of Thiele and Iredale (omitting one of the latter's new genera):

1. A single ligamental cartilage in a pit. Animal occupying only the upper part of the more or less attenuated shell.
    - (*a*) Byssus present. Hinge-line straight, more or less elongated .. .. .. *Malleus*
    - (*b*) Byssus absent. Hinge-line short.. .. .. *Vulsella*
2. Several ligamental cartilages in pits.
    - (*a*) Elongate, animal extending along the shell. Muscle scars separate.. .. *Isognomon*
    - (*b*) Broad, hinge-line very broad. Muscle scars coalescing .. .. .. *Melina*
    - (*c*) Oblong-oval, nacreous area covering nearly whole of interior, muscle scars coalescing (S. African species), deeply impressed .. .. *Parviperna*
    - (*d*) Oblong-oval, nacreous area not nearly covering whole of interior; hinge-line crenulate; no byssal sinus .. .. *Crenatula*

Iredale (1939) stated for *Melina* in the key p. 319 'umbonal area very shallow', but in generic diagnosis on p. 325 'umbonal area is deep'.

Malleus regula (Forskål)

Fig. 10 *b*

Ostrea regula Forskål, 1775, p. 124.
Malleus decurtata Lamarck, 1819, p. 145; Reeve, 1858, pl. 3, fig. 10; Dautzenberg, 1929, p. 564; Prashad, 1932, p. 105.
Vulsella nuttalli Conrad, 1837, p. 257, pl. 20, fig. 10; Dall, Bartsch, Rehder, 1938, p. 68, pl. 14, figs. 6–9.

Malleus regula (Forskål), Reeve, 1858, pl. 2, fig. 4; Odhner, 1917, p. 17; Dautzenberg, 1929, p. 564; Prashad, 1932, p. 105 (references).
Malleus tigrinus Reeve, 1858, pl. 3, fig. 7; Sowerby, 1897, p. 27.
Pinna saccata (*non* Rve.), and var. *similis* Turton, 1932, p. 218, pl. 56, nos. 1517, 1518.
Pinna aenigmatica Turton, 1932, p. 219, pl. 56, no. 1521.

External concentric growth-lines on the part corresponding with the nacreous area more or less lamellose, those on the extension irregularly lamellate. Faint radiating riblets on early part of shell (up to 3 mm. alt.) in the Zululand shell, and feeble traces towards the end of the extension, mainly on the left valve. No riblets traceable on the Mozambique shells.

The internal rib is faintly traceable on the external surface in the Zululand shell, not as a raised rib but by the greater opacity than the translucent area on either side of it.

The Zululand shell has the nacreous area very sharply defined from the thin extension by a raised rim; in the Mozambique shells this raised rim is not so distinct though the nacreous area is equally sharply defined. In the latter also the internal rib is not so distinct.

Minute obscure denticles on the hinge.

White (Zululand); brown with irregular castaneous or purplish mottling, the nacreous areas are suffused (Mozambique).

Alt. 23, hinge-line 7 mm. (Zululand); alt. 45, hinge-line 9 mm., and 40 × 9 mm. (Mozambique). Nacreous area subcircular, length 7, alt. 6·5 mm. (Zululand); oval, length 11, alt. 17 mm., and 15 × 20 mm. (Mozambique).

Durban (Sowerby); Port Alfred (Turton).

Off Durnford Point (Zululand), 45 fathoms, one living (S. Afr. Mus. A9486 P.F. coll.).

Mozambique Island, littoral, 2 living (S. Afr. Mus. coll. K.H.B.).

Distribution. Red Sea, Suez, Persian Gulf, Madagascar, Indo-Pacific.

Remarks. It seems amazing that Turton could assign his shells with 'straight flat top' to *Pinna*. Both photos show the longitudinal rib, and this is specially mentioned for *aenigmatica*. No. 1518 is more strongly ribbed than the present shells. Winckworth (1936, p. 21) referred to *aenigmatica* as 'This gruesome piece of beach refuse'. But he missed the one essential clue to its generic position.

Odhner remarked that this species is easily recognized by the internal rib on the tongue-like extension. Prashad agreed, but stated that *daemonicus* Rve. also had a similar rib.

Malleus anatinus (Gmelin)

Ostrea anatina Gmelin, 1790, p. 3333; Brugière, 1797, pl. 177, fig. 14.
Malleus anatina (Gmelin) Chenu, 1862, fig. 816.

One specimen, undulate and semicircularly curved, measures 45 mm. from umbo to end of posterior hinge extension, vertical from hinge-line to lowest part of curved margin *c.* 80 mm., from umbo to end of shell *c.* 120 mm., interior nacreous area extending *c.* 30 mm. from ligament. Posterior retractor united with posterior adductor.

Corneous with scattered black spots and short streaks, nacre violaceous. 29° 58′ S., 31° 02′ E., 49 metres, 3 specimens (U.C.T.).

Distribution. East Indies.

Gen. VULSELLA Bolten

Smith, 1911, pp. 306–312, pl. xi.

Usually living in sponges, in correlation with which habitat apparently the byssus has been suppressed.

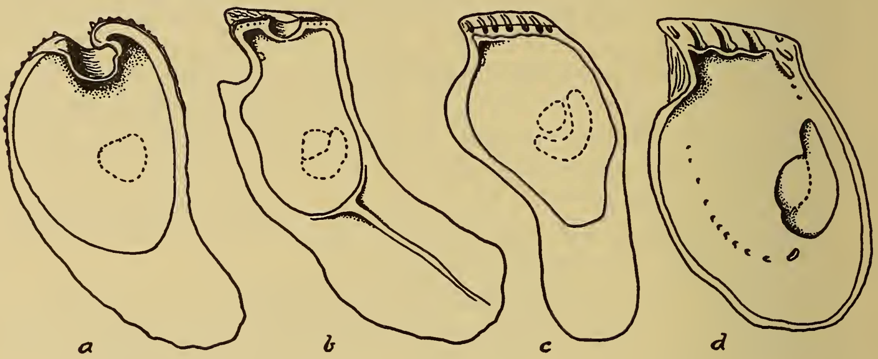


FIG. 10. *a*, *Vulsella minor* Röding. *b*, *Malleus regula* (Forskål), specmen from Mozambique Island. *c*, *Isognomon* sp., from Delagoa Bay. *d*, *Parviperna dentifera* (Krss.).

Vulsella minor Röding

Fig. 10 *a*

Vulsella minor Röding, 1798, p. 156; Prashad, 1932, p. 89, pl. 2, figs. 46–49 (bad photos).
Vulsella attenuata Reeve, 1858, pl. 1, fig. 5; Smith, 1911, p. 309; Tomlin, 1923, p. 51; Dautzenberg, 1929, p. 565.
Vulsella vulsella (*non* Linn.), Smith, 1910, p. 213.

Umbones widely separated. A deep ligamental fossa in each valve. Radiating ribs more or less squamose where they are crossed by the concentric growth-lines, especially on anterior and posterior margins. Brown, radiating lines not very distinct.

Length 10, alt. 19, thickness (two valves) 8, distance between umbones 6 mm.

Tongaat, Port Shepstone, Alexandra Junction, Umkomaas (Smith); Durban (U.C.T., identified by Tomlin), Port St. Johns, and Umhlali (U.C.T.).

Off Durnford Point (Zululand), 13 fathoms, one living (S. Afr. Mus. A5395 P.F. coll.).

Distribution. Red Sea, Suez, East Indies, Madagascar.

Remarks. The P.F. specimen, measurements given above, was identified by Sowerby as a young *lingulata* Lam., but evidently agrees with the Natal specimens with widely separated umbones which Smith (1911) called *attenuata.*

V. vulsella (Linn.) also occurs at Madagascar; it is distinguished by the umbones being closer together, and the ligament pit not so conspicuous.

Isognomon perna (Linn.)

Perna costellata Conrad, 1837, p. 246.
Melina costellata Tomlin, 1931, p. 446.
Isognomon (*Melina*) *costellata* Dall, Bartsch, Rehder, 1938, p. 65, pl. 14, figs. 1–5.
Perna sulcata Deshayes, 1850, pl. 81, figs. 3, 3*a*.
Melina perna (Linn.), Smith, 1910, p. 213.
Isognomon perna (Linn.), Prashad, 1932, p. 85.
Isognomon roberti Koch, 1953, p. 22, pl. 5.

Rounded quadrangular, with postero-ventral corner more or less expanded, numerous narrow radiating ribs. Uniform corneous.

Length 66, alt. 66·8, hinge-line 33 mm. (Dall, Bartsch & Rehder); 45 × 48 × 23 mm. (Koch).

Scottburgh (Natal) (Smith); Umtamvuma River (= Port Edward) (Tomlin); Umgazana, 10 miles south of Port St. Johns (Koch).

Distribution. Madagascar, Seychelles, Indo-Pacific.

Remarks. Port Edward is about 65 miles south of Scottburgh, and Umgazana about the same distance south of Port Edward. There is little doubt that *roberti* is a synonym of *costellata.*

Smith accepted *sulcata* Lam. as a synonym of *perna* (Linn.); and the figure of *sulcata* in Cuvier corresponds with the figures of *costellata* in Dall, Bartsch & Rehder, especially with figures 1 and 2 in which the shell is expanded anteriorly. In figures 3 and 4 the shell is more expanded posteriorly, as is also the case in the figure of *roberti.* Cuvier's and Koch's figures both show the ligament pits more widely separated than in D, B, & R's figures 2 and 3.

Prashad stated that *perna* was a very variable species.

Koch's figure of the interior of the right valve seems to show an oval muscle scar attached to the anterior end of the curved posterior adductor scar. The other figures here quoted do not show the muscle scars.

Isognomon sp.

Fig. 10 *c*

Buff or horny coloured specimens, with pale nacreous interior, approximately 25 mm. length, 60 mm. alt., are probably referable to *isognomon* Linn.; but I do not wish to add another name to those already recorded (*anomioides, perna, vulsella*) without comparison with more material.

The posterior retractor scar lies within the curve of the posterior adductor scar but does not seem to be actually contiguous.

Delagoa Bay (S. Afr. Mus. A9487 coll. K.H.B.); Mozambique Island (U.W.).

Gen. PARVIPERNA Iredale

Iredale, 1939, p. 322.

This genus was instituted for some small black species of 'Perna'. The South African small black Perna was not mentioned.

The genus was defined as follows: squarish, ovate-oblong not attenuate, nearly equivalve, byssiferous, umbones terminal, ligamental cartilage pits 4–5; nacreous area covering nearly whole of the interior, the non-nacreous margin narrow; muscle scars large, deeply impressed.

The generic key on p. 319 stated 'small nacreous area, muscle scars not coalescing'. As the first character conflicts with the diagnosis on p. 322, one cannot well trust the accuracy of the second character. No figure of the muscle scars was given. In the descriptions of the two species assigned to this genus, the words 'anterior' and 'posterior' [sides of the shell] seem to have been transposed.

The above diagnosis would include *dentifera* except for the one doubtful character of the muscle scars. The deeply impressed muscle scars, including those of the pallial line muscles, are very noticeable in *dentifera*. The posterior retractor and adductor scars are always confluent, and usually the junction between the two cannot be traced.

I think no great harm will be done if the definition of *Parviperna* is amended by including the words: muscle scars coalescing or (*fide* Iredale) not coalescing.

Parviperna dentifera (Krss.)

Fig. 10 *d*

Perna dentifera Krauss, 1848, p. 28, pl. 2, fig. 9; von Martens, 1880, p. 316; Braga, 1952, p. 100, pl. 8, fig. 9; Macnae & Kalk, 1958, pp. 34, 119, 120, 129.
Isognomon dentifera (Krss.), Day & Morgans, 1956, p. 307.

Shape variable, usually oblong-oval, but sometimes subcircular. The short ridge-like oblique teeth at postero-dorsal corner behind the last ligament pit may be either one in the left, two in the right valve, or vice versa.

Blackish or brownish, violaceous, interior usually dark violaceous, but sometimes pale, the narrow non-nacreous margin black, but likewise sometimes pale.

31 × 19 mm. (Krauss); 23 × 15 mm. (S. Afr. Mus.).

Natal (Krauss); Scottburgh (S. Afr. Mus. coll. Burnup); Karridene and Durban (U.C.T.).

Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also Braga; also U.W.); Maxixe (U.C.T.); Mozambique Island (S. Afr. Mus. coll. K.H.B.; also U.W.).

Distribution. Réunion (von Martens).

Crenatula mytiloides Lam.

Crenatula mytiloides Dautzenberg, 1929, p. 565.

Obliquely ovoid, hind margin straight, oblique to the hinge-line. Length 50, hinge-line 30, alt. 35 mm. Violaceous black.

Bazarute Island (A. E. Dichmont, 1961).

Distribution. Red Sea, Madagascar.

Remarks. The species of this genus live among sponges; the external surface is sometimes completely enveloped in sponge. The animal has no byssus, and there is no byssal sinus in the shell.

Fam. **Pteriidae**

Pteria chinensis (Leach)

Fig. 12 *d*

Avicula chinensis Leach, 1814, p. 86, pl. 38, fig. 1.
Avicula crocea Lamarck, 1819, p. 148; Chenu, 1862, fig. 786.
Pteria chinensis (Leach), Tomlin, 1931, p. 446; Prashad, 1932, p. 92 (references).

Surface smooth; hind wing bluntly pointed, posterior indent shallow. Hinge-line slightly callused below and in front of umbo, scarcely nodular, a long narrow posterior ridge. Scars of the posterior retractor and adductor separate.

Dark brown postero-dorsally, reddish-brown radial streaks, mostly narrow or in pairs or partly united, on a pale ground colour, fading out anteriorly.

Length 78, alt. 28 mm.

Umhlali (Natal) (Tomlin, *fide* Burnup); Delagoa Bay (U.W.).

Distribution. Indo-Pacific.

Remarks. I have seen the Delagoa Bay specimens. They are not like Chenu's figure of *crocea*, which has a long hind wing; they are more like his figure of *heteroptera*. Prashad, however, said that the hind wing was not so well marked in young shells.

Pteria zebra (Rve.)

Avicula zebra Rve. Sowerby, 1897, p. 27.
Pteria zebra (Rve.), Odhner, 1917, p. 16, pl. 1, figs. 6–8; Prashad, 1932, p. 91; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, p. 129.
Electroma zebra (Rve.), Iredale, 1939, p. 333.

A Durban specimen: length 20, alt. 13 mm.; the False Bay specimen: 15 × 11 mm.

Port Elizabeth (Sowerby).

Living: False Bay, one (U.C.T.).

34° 35′ S., 21° 11′ E., 75 metres, one (St. Sebastian Bay) (U.C.T.); Durban (S. Afr. Mus. A3656 coll. K.H.B.); Durban and Inhambane (U.C.T.); Delagoa Bay (U.W.).

Distribution. Ceylon, Maldives, Indo-Pacific.

Remarks. Dr. Rehder (U.S. Nat. Mus.) saw the U.C.T. specimen from False Bay, and suggested (in litt. to Prof. Day, 25 March 1955) that it might bear the name of the oldest species: *physoides* (Lam.). It does not differ from Durban specimens named *zebra* by Tomlin. Odhner and Prashad have recorded *zebra* without reference to *physoides*; Iredale said the Lamarckian names *physoides* and *virens* for Australian shells 'deserve investigation'. The descriptions (at least in the 2nd edition of *Anim. sans Vert.* vii, p. 101, 1836) are inadequate. Meanwhile, therefore, it seems better to record the South African shells under the well-known name *zebra*.

Sowerby's record was almost certainly a dead shell, but the U.C.T. records from False Bay and St. Sebastian Bay indicate that the species does occur in Algoa Bay, though rarely. No specimens were obtained by the *Pieter Faure*.

Odhner found that the thickness of the stripes varied according to the species of Hydroid to which the shell was attached. He figured young shells in which the stripes were longitudinal (but not radiating from the umbo). In later growth (at about 6 mm. long in the present specimen) the stripes become more or less zigzag, and on the dorsal area (between hinge-line and the dark stripe from umbo) become transverse cross-bars almost perpendicular to the hinge-line.

P. tomlini Prashad (1932, p. 94, pl. 3, figs. 3, 4) appears to differ in having only cross-bars; no longitudinal stripes are visible on the early part of the shell in the figures.

Electroma vexillum (Rve.)

Fig. 12 *a*

Avicula vexillum Reeve. 1858 Avicula. Sp. 70, pl. 17, fig. 70; Herdman, 1906, p. 117, pl. figs. 33, 34.

Semi-transparent, faintly greenish, usually darker or with a dark and a whitish stripe from umbo to hind margin, on either side of the median ridge dark cross-bars, often undulating or zigzag.

Greatest length (left valve) 5·5, alt. 4 mm. Mr. A. E. Salisbury informed me that the species grows to 18–20 mm. with alt. 12–13 mm.

Delagoa Bay, attached to weed (U.W.).

Remarks. In Herdman's Report these small molluscs are referred to as 'false spat', as opposed to the spat of the Pearl Oyster.

E. pygmea Iredale, 1939, is very similar; but in the present specimens the cross-bar markings are rather more definite than in either Herdman's or Iredale's figures. Iredale seemed to think his specimens, 8 × 5 mm., were adult ('apparently adult').

Gen. PINCTADA Bolten-Röding

Jameson, 1901, pp. 372–94.

Jameson divided the species into two groups: one without trace of hinge-teeth, the other with one or two denticles in front of the ligament [i.e. the middle deeper part of the ligament] and a short ridge behind, nearly parallel with the hinge-line. This division was weakened by the occasional presence of hinge-teeth in the young of one of the species of the 1st group (p. 379), and by the teeth frequently becoming obsolete in the 2nd group.

Herdman (1906, p. 117, pl. figs. 28, 29) figured the hinge of the spat of *vulgaris* at 1 mm. diameter with 5 anterior and 5 posterior teeth in each valve. These teeth disappear with later growth.

So far as I am aware the spat of the Cape pearl oyster has not been examined. From examination of the limited material at hand, hinge teeth are present in young shells but obsolete in older ones, in accordance with Jameson's 2nd group.

I propose to adopt for the common Cape pearl oyster Sowerby's name *capensis*, leaving future detailed research to determine its identity with, or relationship to *margaritifera* and *vulgaris*.

According to Jameson *margaritifera* (Linn.) var. *zanzibarensis* (Jameson), *capensis* (Sow.), *vulgaris* (Schum.) and *anomioides* (Rve.) all occur at Bazarute Island off the coast of Portuguese East Africa; according to Sowerby 1897, Jameson 1901, and Smith 1903 *vulgaris* (Schum.) and *natalensis* (Jameson) occur in Natal.

The method of reproduction, and life history of *capensis* should be investigated. According to Seurat (1904, p. 359) *margaritifera* is dioecious and oviparous.

Pinctada capensis (Sow.)

Fig. 11 *a–c*

Avicula margaritifera Linn. var., Krauss, 1848, p. 29.
Avicula meleagrina capensis Sowerby, 1889b, p. 158, pl. 3, fig. 10; 1892, p. 65, pl. 3, fig. 75.
Pteria margaritifera (*non* Linn.), Odhner, 1923, p. 4.
Pinctada capensis (Sow.), Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, p. 129.
Pteria capensis (Sow.), Franca, 1960, p. 89, pl. 20, fig. 1.

Shell variable in shape, but Sowerby's figure shows the common shape when not distorted. Grows to about 130 × 130 mm. As Krauss noted, large specimens tend to become thick-walled (10–15 mm.) and heavy.

The anterior tubercle and posterior linear ridge (tooth) are well marked in a specimen (smallest seen) with hinge-line 11 mm.; but they disappear at about 35–40 mm. hinge-line; the linear tooth is more persistent than the tubercle, and may be traceable in shells with hinge-line 50 or 55 mm.

Ground colour buff or corneous; dark brown or reddish-brown radiating stripes, some of them sometimes double; (pale stripes on a dark ground would be equally correct); nacre white, margin dark purplish-brown ('Black lip'). The dark margin occurs in shells with hinge-line *c.* 25 mm., but in younger shells is not so obvious, the external radiating stripes showing through the thin shell and giving a more or less mottled coloration.

The most westerly recorded locality is Dyer's Island (off Danger Point) (Odhner), presumably living. Occurs living in St. Sebastian Bay, low tide, and in Mossel Bay, 12 fathoms (S. Afr. Mus. P.F. coll.). U.C.T. obtained young specimens at 33° 38′ S., 26° 54′ E., 30 fathoms, also at Durban and Inhambane.

Delagoa Bay (U.W.); Bazarute Island (Jameson).

Var. *natalensis* (Jameson)

Margaritifera natalensis Jameson, 1901, p. 383, fig. 93; Smith, 1903, p. 394.

This appears to be no more than a variety, if even that, of *capensis*, with more intense, almost black, radiating stripes.

Described from Umkomaas (Natal), 70 × 70 mm., hinge-line 55 mm.

U.C.T. collected it at Kosi Bay, and I found it at Delagoa Bay and Mozambique Island. Bazarute Island (S. Afr. Mus.).

The Delagoa Bay specimens, hinge-line 20–35 mm., show the anterior tubercle and posterior linear tooth.

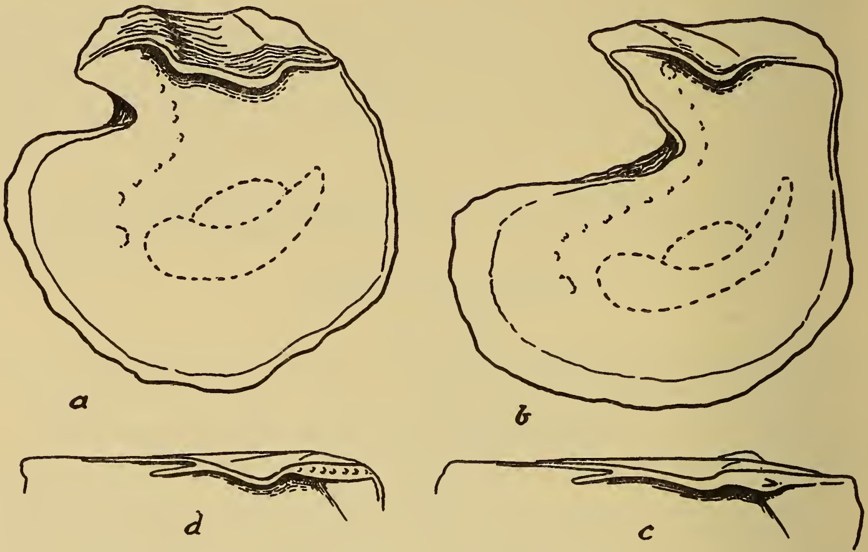


Fig. 11. *Pinctada capensis* (Sow.). *a*, *b*, a thick heavy shell, and a distorted shell, both 130 × 130 mm. *c*, hinge of a juvenile (hinge-line 32 mm.). *d*, *Pinctada* sp., hinge-line 8 mm., from Mozambique Island. (*a*, *b*, right valves; *c*, *d*, left valves.)

A small Mozambique specimen, hinge-line 8 mm. (fig. 11 *d*), has 6(7) anterior denticles and a posterior linear tooth. A juvenile attached to this 8 mm. shell, with hinge-line 2 mm., has no denticles and no posterior tooth. On the other hand a specimen with hinge-line 19 mm. has a posterior tooth but no anterior denticle.

Pinctada margaritifera (Linn.)

Margaritifera margaritifera var. *zanzibarensis* Jameson, 1901, p. 375.
Meleagrina margaritifera (Linn.), Braga, 1952, p. 99, pl. 8, fig. 1.

Bazarute Island (Jameson); Delagoa Bay (Braga).

Braga's figure might well portray a *capensis* shell.

Pinctada anomioides (Rve.)

A single living example from Scottburgh (Natal) (S. Afr. Mus. coll. K.H.B.) was identified by Tomlin. It has a hinge-line 18 mm., with a posterior linear tooth and a feeble anterior tubercle. Translucent white with 4 or 5 opaque white radial stripes on the left valve.

Pinctada sp.

Three shells from Mozambique Island (S. Afr. Mus. coll. K.H.B.), hinge-line 17–27 mm., and two shells from 'South Africa' (S. Afr. Mus.) hinge-line 27 and 41 mm. with denticle and linear tooth.

Colour gamboge or golden-yellow, with faint indications of radiating stripes, or irregular markings.

Pinctada sp.

Fig. 12 *c*

Hind wing distinct, posterior indent right-angled. Surface smooth in smaller specimen; larger specimen smooth on earlier part, later lamellose-squamulose. Hinge with 2 denticles and 2 posterior ridges. Posterior retractor scar embraced by the crescentic posterior adductor scar. Brown; the smaller shell with a dark radial stripe from umbo to hind margin on left valve only.

Length 27, alt. 16 mm. (Mozambique); 20 × 13 mm. (Inhambane).

Mozambique Island (S. Afr. Mus. coll. K.H.B.); Inhambane (U.C.T.).

Pinctada sp.

Fig. 13 *a*

A small specimen found in a bottom sample taken off Umkomaas (Natal), 40 fathoms (S. Afr. Mus. no. A9488 P.F. coll.), is a case of incubation. The specimen is clearly a *Pinctada*, not an *Ostrea*.

Shell subcircular, scarcely oblique, with straight hinge-line; right valve fitting within the left; a slight indent on anterior margin on left valve, a stronger indent on the right; hind margin slightly indented dorsally. Surface smooth, with concentric growth-lines. A rather broad non-nacreous margin. Hinge-line without anterior denticles but with a series of 10–12 minute granules posteriorly.

When opened the dried shell was found to contain about 12 shelled juveniles (2 or 3 were broken in opening the shell). The foot and byssus were intact. The juveniles varied from 0·7 to 1 mm. in length, very slightly oblique, hinge-line straight, hinge without denticles.

Fam. **Pinnidae**

Rosewater, 1961.

These shells live in an upright position in gravel or sandy mud, the apex deeply buried and anchored by the byssus, the posterior end projecting a short distance above the surface. The anatomy of the animal is correlated with the vertical position of the shell. They are often gregarious, packed closely together in large colonies (Macnae & Kalk, 1958, pp. 43, 45, 92).

The small pea-crab (*Pinnotheres*) lives commensally within the shells; shrimps (*Anchistus*, *Paranchistus*, *Conchodytes*) have also been recorded as commensals.

Field investigation into the growth and variability in colonies of Pinnas would be welcome. Winckworth (1929, p. 284) referred to the different shape of the shell at different growth stages.

Owing to great variability in shape numerous names have been given to supposed 'species'. The recent exposition by Rosewater (1961) reduces the number of Indo-Pacific (including South Africa) species to nine, of which five are known from South Africa.

Sowerby (1897, p. 27) recorded *squamossima* Phil. from South Africa and *serra* Rve. from Durban. The former is considered a synonym of *serrata*, a West Atlantic species; and the name should be deleted from the South African list. Winckworth considered *serra* a synonym of *pectinata* Linn., a species known from India eastwards. This species is not likely to be found in South African waters, and the original provenance of Sowerby's specimen cannot be checked.

Key to South African species (after Rosewater)

1. Nacreous layer divided longitudinally by a groove. Externally a longitudinal ridge anteriorly	*Pinna*
(*a*) Posterior margin squarely truncate. Posterior adductor scar often extending on to ventral lobe of nacreous layer	*muricata*
(*b*) Posterior margin arcuate or rounded. Posterior adductor scar not extending on to ventral lobe	*bicolor*
2. Nacreous layer not divided, no external ridge	
(*a*) nacreous layer occupying whole anterior part of shell	*Atrina*
(i) Shell thick, heavy, black	*vexillum*
(ii) Shell thin, with squamiferous projections	*squamifera*
(*b*) Nacreous layer confined to dorsal anterior part of shell. Usually contorted	*Streptopinna saccata*

Pinna muricata Linn.

Pinna muricata Linn., Winckworth, 1929, p. 285, fig.; Rosewater, 1961, p. 188, pl. 139, figs. 1, 2 (embryonic valves), pls. 141–145.
Pinna semicostata Conrad, Dall, Bartsch & Rehder, 1938, p. 74, pl. 18, figs. 7–10.
Pinna aequilatera von Martens, 1880, p. 317, pl. 22, fig. 4.
Avicula [*sic*] *aequilatera* (von Mrtns.), Day & Morgans, 1956, p. 307 (listed); Macnae & Kalk, 1958, pp. 65, 92, 129.
Pinna squamifera (*non* Sow.), Franca, 1960, p. 90, pl. 20, fig. 2.

Posterior margin of shell more or less squarely truncate. External ridge distinct on earlier half or two-thirds. Radiating ribs 12–26, but fewer in juveniles (e.g. 10 at 25 mm. length). Squamae present or absent. Nacreous layer occupying anterior half to two-thirds, divided into two lobes by a very narrow groove; both lobes posteriorly truncate or broadly rounded, the dorsal lobe extending farther than ventral lobe. Posterior adductor scar on the dorsal lobe, but usually extending onto the ventral lobe. Pigmented glands (organs of Will, or so-called 'eyes') on the mantle lobes inconspicuous and widely spaced (contrast *bicolor*).

Up to 311 × 149 mm. (Rosewater); South African Museum 155 × 59 mm.

Cream or pale horny colour, often obscurely blotched or spotted with brown or greenish-brown, nacreous layer glossy white or silvery.

Port Alfred (Rosewater); Durban (S. Afr. Mus. coll. Col. J. H. Bowker, 1882; also U.C.T.); Delagoa Bay (U.W.); Inhambane (U.C.T.); Mozambique Island (U.W.).

Distribution. East coast of Africa, Indo-Pacific, North Australia, and including oceanic islands.

Remarks. Smith (1906, p. 60) included *aequilatera* von Martens in the South African fauna-list, with the curious remark that he could find no description of the species.

Winckworth (1929) accepted *natalensis* Smith 1906 as a distinct species, with *densecostata* Turton 1932 as synonym. Rosewater regards both as synonyms of *bicolor*. I am more inclined to regard *natalensis* as a synonym of *muricata*; but an examination of the muscle scar might decide the question.

Pinna bicolor Gmelin

Pinna bicolor Gmelin, Odhner, 1917, p. 7; 1919, p. 3, pl. 1, fig. 1 (margin broken); Dautzenberg, 1929, p. 568; Winckworth, 1929, p. 286, fig.; Rosewater, 1961, p. 193, pls. 147–153.
Pinna dolobrata Lam., Hedley, 1924, p. 144, pl. 20, fig. 9, pl. 21.
?*Pinna natalensis* Smith, 1906, p. 60, pl. 8, fig. 9.
Pinna densecostata Turton, 1932, p. 219, pl. 56, no. 1520.
Atrina bicolor (Gmelin) Macnae & Kalk, 1958, pp. 45, 129.

Differs from *muricata*: posterior margin arcuate or rounded; fewer ribs (8–17); ventral lobe of nacreous layer rounded posteriorly; posterior adductor scar not extending onto ventral lobe; pigmented glands on mantle conspicuous and close together; darker colour, cross-bars on early part of shell, changing later to radiate streaks, especially at posterior margin.

Up to 495 mm. (Rosewater).

Port Alfred (Turton: *densecostata*); Durban (Smith: *natalensis*); Umpangazi, Zululand (U.C.T.); Delagoa Bay (U.W.); Inhambane (U.C.T.); St. Carolina, Bazarute Island (Rosewater).

Distribution. East coast of Africa, Indo-West Pacific, Australia, but excluding oceanic islands.

Remarks. The *living* occurrence of this species south of Delagoa Bay has been confirmed by U.C.T. at Umpangazi.

Atrina vexillum (Born)

Pinna vexillum Born, 1778, p. 118; 1780, p. 134, pl. 7, fig. 8; Sowerby, 1897, p. 27; Winckworth, 1929, p. 287.
Pinna nigra Dillwyn, 1817, p. 325; Braga, 1952, p. 100.
Pinna nigrina Lamarck, 1819, p. 135; Chenu, 1962, fig. 821.
Atrina vexillum (Born), Macnae & Kalk, 1958, p. 129; Rosewater, 1961, p. 204, pl. 139, figs. 3, 4 (embryonic valves), pl. 139, pls. 156–158.

Shell thick, heavy, somewhat inflated, more or less hatchet- or flag-shaped (ventral margin lobed). Radiating ribs and squamae present or absent. Posterior adductor scar large, projecting (in adult) beyond margin of nacreous layer.

Up to 480 mm. (Rosewater). Very dark, almost black.

Durban (Sowerby); Delagoa Bay (U.W.); Port Amelia (Braga).

Distribution. East coast of Africa, Indo-Pacific, North Australia.

Remarks. Sowerby's record from Durban was probably based on a dead shell.

Atrina squamifera (Sow.)

Pinna squamifera Sowerby, 1835, p. 85; Krauss, 1848, p. 27, pl. 2, fig. 8; Smith, 1903, p. 394; Sowerby, 1904, p. 3.
Pinna afra Sowerby, 1835, p. 85.
Pinna kraussii Hanley, 1858, p. 226.
Pinna pernula (*non* Chemn.), Sowerby, 1892, p. 65.
Atrina alfredensis Bartsch, 1915, p. 183, pl. 40, fig. 3.
Pinna segmenta Turton, p. 1932, 217, pl. 56, no. 1510.
Pinna whitechurchi Turton, 1932, p. 218, pl. 56, no. 1512.
Pinna rufanensis Turton, 1932, p. 218, pl. 56, no. 1513.
Pinna sp. Turton, 1932, p. 218, pl. 56, no. 1516 (= juv.).
Atrina squamifera (Sow.), Macnae & Kalk, 1958, pp. 45, 92, 129, fig. 23 *e*; Rosewater, 1961, p. 207, pls.
[*Non*] Franca 1960 (= *muricata*).

Shell thin, fragile, elongate-triangular, posterior margin rounded-truncate. Radiating squamiferous ribs 6–12, with several additional on ventral slope, making this area rugose. Posterior adductor scar not projecting beyond margin of nacreous layer, the margin of the nacreous layer with a notch ventral to the scar.

Up to 390 mm. (S. Afr. Mus.). Smallest specimen seen 34 × 14 mm. Other measurements to show variation in the length/breadth ratio: 64 × 30 and 65 × 24; 72 × 32; 75 × 43, 95 × 50, 109 × 52, 128 × 56, 130 × 51, 170 × 85, 250 × 125, 360 × 165 and 390 × 140 mm. The first and last pairs are perhaps the most striking.

Light horn colour when young, becoming brown or dark brown.

Fossil: Quaternary, Sedgefield near Knysna (A. R. H. Martin).

Saldanha Bay, Table Bay, Hout Bay (west coast of Cape Peninsula), False Bay, Hermanus, Still Bay, Mossel Bay, Knysna, Port Elizabeth (S. Afr. Mus.); Port Alfred (Bartsch, Turton); Natal (Hanley).

Off East London, 43 fathoms (S. Afr. Mus. P.F. coll.).

33° 47′ S., 26° 4′ E., 26 fathoms, and 34° 20′ S., 24° 22′ E., 120 metres (U.C.T.). Delagoa Bay (U.W.).

Remarks. The smallest specimen seen (34 mm.) has no squamae: these begin to develop at about 40–50 mm. length, at first on the dorsal area, extending later over the whole width of the shell.

Krauss said he had used the name *P. capensis* in a preliminary identification of his specimens but had later come to the conclusion that they were the same as *squamifera*, of which he gave a description and figure. Rosewater (p. 210) has misread Krauss; there never was a type of *capensis*.

Winckworth (1929 and 1936) rightly put Bartsch's *alfredensis*, and some of Turton's 'species' into synonymy. He did not, nor did Rosewater (1961, pp. 209, 224) recognize that '*saccata*' and its var. *similis* were specimens of *Malleus*, having a 'straight flat top' (see *Malleus regula*, p. 407).

The most westerly locality given by Rosewater is Jeffreys Bay, though he mentioned in the synonymy Krauss's locality Knysna. Consequently he considered the species was limited to the south-eastern part of South Africa. He refers, however, to the similarity between *squamifera* and the European *fragilis* Penn. and the West African *chautardi* Nicklès 1953, the latter extending as far south as Angola. 'These three forms may be remnants of a former continually [= continuously] distributed species now broken up into isolated populations which merit specific rank' (Rosewater, p. 208). Future research may obtain specimens from localities between Saldanha Bay and Angola, and thus refute the apparent discontinuous distribution.

Streptopinna saccata (Linn.)

Fig. 12 *b*

Pinna nuttallii Conrad, 1837, p. 244.
Atrina nuttallii (Conrad) Dall, Bartsch & Rehder, 1938, p. 76, pl. 18, figs. 1–4.
Pinna saccata Linn., Sowerby, 1897, p. 27.
Pinna (*Streptopinna*) *saccata* Linn., von Martens, 1880, p. 318; Winckworth, 1929, p. 289; Prashad, 1932, p. 138.
Streptopinna saccata (Linn.), Iredale, 1927, p. 333, pl. 46, figs. 9–11; Rosewater, 1961, p. 221, pl. 136, figs. 5, 6, pls. 169–171.
[*Non*] Turton 1932 (= *Malleus regula*).

A particularly variable species as regards the length/breadth ratio, apart from the distortion which many of the shells undergo.

Measurements: 85 × 50, 95 × 65, 110 × 50, 115 × 48, and 115 × 51 mm. Two other specimens cannot be measured owing to the strong curvature of the valves.

In all, except one, of the present 7 shells, the curvature is towards the right, i.e. the left valve is more or less markedly convex, the right correspondingly concave. Two shells after growing straight for about 60–65 mm., curve round at right angles, so that the shell viewed in dorsal aspect is L-shaped.

The dorsal margin may be straight, slightly convex, or concave. The ventral margin is more or less strongly convex, with at about 40 mm. length a wide and shallow indent, or a sharply marked notch, anterior and posterior to which the margin is more or less lobate. In later stages of growth the dorsal margin (beyond the hinge) of the two valves appears to be completely fused. This is very clearly seen in the two L-shaped shells.

There are 5–7 broad, low, rounded radial ribs on the dorsal half of the shell; later (after a length of about 70 mm.) similar but even less conspicuous ribs appear on the ventral area also, totalling about 12. One very broad example, 55 × 38 mm. (fig. 12*b*) has 16 ribs; the length may have been longer, as the posterior margin is broken.

Nacreous area confined to the dorsal anterior third part of shell, its posterior margin concave dorsally to the posterior adductor scar. Anterior adductor scar small, on a shelf at the tip of the shell.

Byssus present (Rosewater, p. 222); confirmed in a 38 mm. specimen (Port St. Johns), and U.C.T. specimens (largest 97 × 55 mm.).

Up to 235 mm. (Rosewater).

Natal (Sowerby); Durban Harbour (S. Afr. Mus.); Umzikaba, Port St. Johns (S. Afr. Mus. coll. F. H. Talbot); Umhlali (Natal) (U.C.T.).

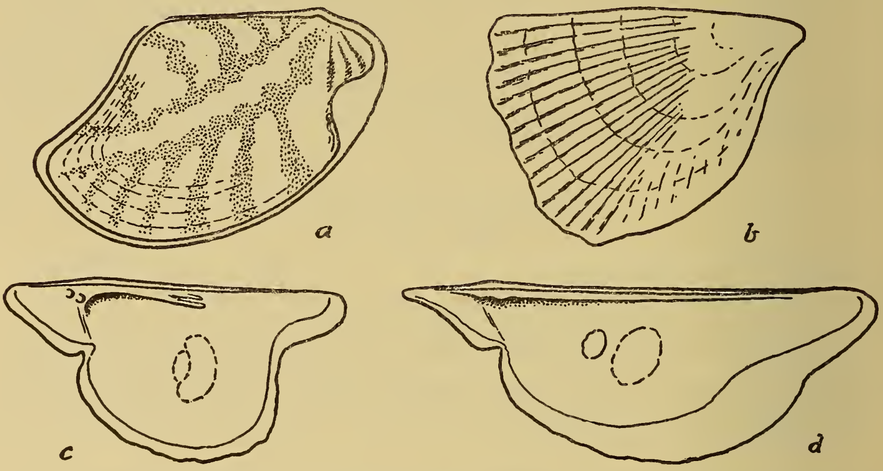


Fig. 12. *a*, *Electroma vexillum* (Rve.). *b*, *Streptopinna saccata* (Linn.) (S. Afr. Mus. no. 5425) half-grown, 55 × 38 mm. *c*, *Pinctada* sp. (Mozambique Island and Inhambane). *d*, *Pteria chinensis* (Leach), Delagoa Bay.

Distribution. Red Sea, east coast of Africa, Seychelles, Réunion, Mauritius, Madagascar, East Indies, Pacific.

Remarks. Von Martens recorded that this species lived vertically in hollows in Madrepore corals; and Rosewater says under and between rocks; such a habitat would account for the remarkable distortion of some of the shells.

Fam. **Pectinidae**

Grau. 1959 (Eastern Pacific species).

Some Indo-Pacific species: *P. squamosus* Gmelin, *Ch. testudineus* (Rve.), *noduliferus* (Sow.), *cuneolus* (Rve.) have been recorded from Natal and Durban. One suspects Sowerby's (1897) record of *squamosus* to refer to the later described *natalensis* Smith. *Ch. noduliferus* was sent to Smith by Quekett, Curator of the Durban Museum; the provenance of a specimen of this Mauritian shell is suspect, at least one cannot place so much reliance on its being a Natal shell as one can on the other species which were forwarded by Burnup. None of these species has been found in recent years by U.C.T. or U.W.

On the other hand Macnae & Kalk (1958) have listed *P. tranquebaricus* and *Ch. lentiginosus* from Delagoa Bay. The specimens of the former are more probably referable to *senatorius*.

The occurrence of a small incubatory Pectinid, here provisionally assigned to *Cyclopecten*, is noteworthy.

Pecten sulcicostatus Sow.

Pecten sulcicostatus Sowerby, 1842, p. 47, pl. 13, figs. 35, 36; 1892, p. 89, pl. 5, figs. 97, 98; Schwarz, 1910, p. 115; Thiele, 1931, p. 163; Fleming, 1957, pp. 10, 15, 23, 25; van Bruggen, 1961, pl. 1, fig. 4.

Pecten capensis Gray MS. Sowerby, 1892, p. 66 and p. 89 (*erratum*); Johnson, 1904, p. 11.

Both valves convex and smooth up to 6–7 mm. alt., hinge 5–6 mm.; thereafter 12–13 ribs develop and the concentric growth-lines become distinct and lamellose in the grooves; at about 8–10 mm. alt. the 1st sulcus appears in each rib, and at about 13 mm. a 2nd sulcus appears on the left (flat) valve, a 2nd and 3rd on the right; increasing in large shells to 5 on the left and 10–12 on the right valve; on the latter the ribs are low, rounded, and not sharply defined, passing gradually into the shallow narrow grooves, which are also sulcate, so that one may easily count up to 14 or 15 sulci on a rib; at about 10 mm. alt. one or two (sometimes 3) intermediary riblets appear between each pair of main ribs on left valve, but at about 25 mm. alt. they peter out. The lamellose growth-lines cross the ribs on left valve, and continue to the margin in old shells; on right valve they show in the sulci on the ribs and in the grooves, producing a cancellate appearance in early growth, a pitted appearance in later growth. Ears with 4–5 ribs on left valve, 6–7 on right, increasing to resp. 5–6 and 8–9, but less distinct in old shells.

Right valve cream, pale buff, or pinkish; left valve pink or reddish; young shells (up to *c.* 10 mm. alt.) pale, then left valve suddenly becoming darker, the junction sharp but irregular; irregular dark red marks may occur on either valve. A pure white (cream) example has been taken in False Bay (S. Afr. Mus.).

Length 106, alt. (to hinge-line, excluding the projecting umbo) 90, thickness (right valve) 30, hinge-line 52 mm.

Fossil: Pleistocene, Port Elizabeth (Johnson, Schwarz); Sedgefield near Knysna (A. R. H. Martin).

False Bay to Mossel Bay, Algoa Bay, and East London (S. Afr. Mus. P.F. coll.). False Bay 37 metres, and Sebastian Bay, 68 metres (s.s. *Africana*, per U.C.T.).

Remarks. Commoner in False Bay and Mossel Bay than farther east. In Natal its place is taken by *erythraeensis* (*infra*).

Sowerby (1842) said, incorrectly, that the grooves between the ribs on the left valve were sulcate. The 1892 figure 98 shows them correctly.

Juveniles at about 7 mm. alt., before the 1st sulcus has appeared in the ribs (left valve) can scarcely be distinguished from equal sized *fumatus*, except by the stronger lamellose growth-lines.

The development of temporary intermediary riblets on the left valve is noteworthy.

Pecten cf. *erythraeensis* Sow.

Pecten erythraeensis Sowerby, 1842, p. 49, pl. 18, figs. 163, 164; Cox, 1929, pp. 185, 203; Fleming, 1957, pp. 9, 13, 16, 17, 18, 23, 33.
Pecten sulcicostatus Sow. var. *casa* van Bruggen, 1961, p. 31, pl. 1, figs. 1–3.
Pecten fumatus (*non* Reeve), Barnard, 1962b, pp. 184, 192.

Prodissoconch smooth, glossy. Both valves convex up to about 5 mm. alt.; and both smooth up to about 5–6 mm.; thereafter 14–15 ribs develop and concentric growth-lines become distinct, more or less lamellose on left valve, smooth on the right; ribs smooth, but crossed by the lamellose growth-lines on left valve. Ears with 4(5) ribs on left valve, 5–6 on right, in the latter more distinct on the anterior than on the posterior ear; obscure in large shells.

Pale pinkish buff, left valve at about 10 mm., or even earlier at 4·5 mm. alt. suddenly becoming deeper pink or reddish-brown, junction sharp but irregular, and varying; thereafter either uniform or more often similar darker zones appear, more or less zigzag, or with dark Λ-shaped marks (pointing towards the umbo); right valve in young shells more or less mottled or blotched pink or reddish on a pale ground, later more or less uniformly suffused greyish-red.

Length 70, alt. to hinge-line 57, thickness (right valve) 22, hinge-line 35 mm.

Fossil: Quaternary, raised beach at Knysna (S. Afr. Mus.).

Off Tugela River (Natal), 37 fathoms, adult, dead but fresh Morewood Cove, 27 fathoms; Tongaat, 36 fathoms, living; Umhloti, 40 fathoms, adult, dead but fresh; Cape Natal (Durban), 54 fathoms; Illovo, 27–30 fathoms, juv. living Umkomaas, 40 fathoms, juv. living; Umtwalumi, 25 fathoms; Itongazi, 25 fathoms, living; Umhloti and Umkomaas, 40 fathoms, numerous juv. 3–5 mm. alt. (S. Afr. Mus. P.F. coll.).

29° 30′ S., 31° 23′ E., 68 metres (s.s. *Africana*, per U.C.T.).

Remarks. Distinguished from *sulcicostatus* by the non-sulcate ribs, and the absence of temporary intermediary riblets. The growth-lines on the left valve become lamellose only at about 12–15 mm. alt., sometimes not until much later at 30–35 mm. alt.

Pieter Faure specimens were identified by Sowerby as the Australian *fumatus*. In 1962b I accepted this identification, but on further consideration I think that these South African shells are far more likely to be one of the Red Sea species. Cox (1929, p. 203) doubted the occurrence of one and the same species living in the Red Sea and East Australia.

Geological considerations favour a Red Sea species, although the only fossil occurrence in South Africa is of no great age, and there are no East coast records (Cox, 1927, did not record *erythraeensis* from the Zanzibar deposits).

Cox (1929, p. 186) in discussing *erythraeensis*, mentioned the following features as characteristic: on the left valve there are no grooves on the ribs, and there are (usually) no interstitial ribs. These features are found in the South African shells. Presumably the 'interstitial' ribs of Cox are the same as I have here called 'temporary' intermediary riblets; Cox did not say whether they were present only in young shells (in the closely allied *benedictus*).

Cox (1929, p. 186) said that *fumatus* was very close to *erythraeensis* in its shape and the character of its ribbing, but differed in its dark colour. Mr. G. Grau, a specialist on the family, to whom I sent specimens (1962), also remarked (in litt.) on the similarity of these two species, but preferred not to express a definite opinion on the identity of the South African shells.

In these circumstances I refer the South African shells to the Red Sea species, with the hope that future collecting will bring evidence of its occurrence, fossil and/or living, along the east coast of Africa.

Von Hochstetter (1866, p. 37) in describing Pleistocene deposits at the Cape, said that Mr. Layard [Curator, South African Museum] told him that from the Cape to Port Elizabeth there were 'mussel-banks' [? kitchen-middens] 20–25 ft., in places 100 ft. above sea-level, containing in addition to living species of molluscs a species of *Pecten* which had not hitherto been found alive. Probably Layard was referring to *sulcicostatus*, not to the second species here referred to *erythraeensis*.

† *Pecten* sp.

Haughton (1956, p. 332) quoted Cox's description of some fossil specimens of Pecten from Tertiary deposits off the west coast. The right valve was convex, the left flat, and the latter had 'fine, evenly spaced concentric threads crossing the ribs and intervals'.

Three flat left valves from off Cape Point, 120 fathoms (S. Afr. Mus. A9492. P.F. coll. No. 2784) agree with this description. The growth-lines are of course much closer together on the early part of the valve; but at *c.* 10 mm. alt. the rate of growth increased rather rapidly and the growth-lines become farther apart; towards the margin they are 'evenly spaced'. They are slightly undulate, being convex towards the umbo on the ribs, and convex towards the margin in the intervals.

Equilateral. Ribs 20, without any trace of squamulae. Ears cancellate with fine riblets and growth-lines.

Length 15, alt. 14·5 mm.; 18 × 20; part of the lateral margin of the largest valve is missing, alt. 23 mm.

The two smaller valves are slightly worn; the largest is considerably more worn, the growth-lines showing faintly only towards the margin. Pale greyish-buff.

These three valves are unattached, and show both external and internal surfaces. But it is questionable whether the species is living at the present day.

Of the specimens attached to glauconitic-phosphatic nodules, some are internal casts and are greenish-black like the nodules; others still retain portions of the actual shell, which is whitish.

Chlamys tinctus (Rve.)

Fig. 14 *b*

Pecten pusio (*non* Pennant), Krauss, 1848, p. 29.
Pecten limatula var. Smith, 1885, p. 297, pl. 21, fig. 5.
Chlamys humilis Sowerby, 1904, p. 3, pl. 6, fig. 3; Thiele, 1931, p. 163.
Chlamys tinctus (Rve.), Smith, 1906b, p. 59; Turton, 1932, p. 222 and p. 222, pl. 57 no. 1550 (= juv.); van Bruggen, 1952, p. 13, figs. 3, 3*a* (sculpture).
Pecten (*Chlamys*) sp. Thiele, 1931, p. 163.

Prodissoconch smooth, glossy. Surface up to 1 mm. alt. minutely granular; 10–11 ribs begin at about 1 mm. alt., growth-lines distinct, crossing the ribs; at 3 mm. alt. *c.* 17–18 ribs, at 6 mm. *c.* 25; 1st intermediaries begin at *c.* 1.75 –2 mm. alt.; adult shells with *c.* 70 ribs, main, intermediary, and subsidiary (narrow riblets splitting off from and flanking on one or both sides of a main rib). Granules or nodules on ribs where crossed by growth-lines beginning at about 4 mm. alt., thereafter developing into more or less conspicuous squamae. Concentric lamellose growth-lines usually visible in the grooves up to about 10 mm. alt., but thereafter the grooves become relatively narrower owing to encroachment by the intermediaries and especially the subsidiary riblets, and the growth-lines become less lamellose, closer together, and much less conspicuous. Squamae may be strongly or feebly developed, but the lateral parts are always more strongly or more profusely squamose.

Colour variable, pale pink, deep red, orange, yellow, violaceous, uniform or with more or less concentric or zigzag paler bands, e.g. yellow with cream bands which are edged distally with violet.

Length 32, alt. 37 mm.; two-valved examples: 20 × 24, thickness 9, hinge-line 13 mm., and 18 × 20 × 8 × 11·5 mm. The length/altitude ratio varies, e.g.: 16 × 17 (*humilis*) and 14 × 17 mm. (typical *tinctus*).

Fossil: Post Pliocene, Inhambane (Cox 1939); Quaternary, Sedgefield near Knysna (A. R. H. Martin).

Table Bay, False Bay to Mossel Bay (S. Afr. Mus.); Port Elizabeth (Sowerby); Port Alfred (Smith, Turton); Natal (Krauss).

34° 41′ S., 18° 36′ E., 98 fathoms (Smith: *limatula*).

Off Great Fish Point, 51 fathoms; Cape St. Blaize, 90 fathoms (Sowerby 1904: *humilis*).

34° 51′ S., 19° 37′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres; 35° 26′ S., 20° 56′ E., 80 metres (Thiele: *humilis*) and St. Francis Bay, 80 metres (Thiele: *Chlamys* sp.).

Off: Tongaat (Natal), 36 fathoms, one living; Cape St. Francis, 75 fathoms, 2 living; Cape Seal, 80 fathoms, one living; Cape St. Blaize, 85–90 fathoms, 2 living; Cape Point, 180 fathoms, one living; and Mossel Bay, low-tide, one living; also dead valves from numerous localities from Cape Vidal (Zululand), Natal coast, East London, Algoa Bay, Agulhas Bank to False Bay (S. Afr. Mus. P.F. coll.).

Distribution. Tristan d'Acunha (Smith: *limatula*).

Remarks. The figure here given is taken from a series of juveniles from 1 mm. upwards, collected by Dr. Muir at Still Bay.

Smith (1885) stated that the *Challenger* specimen of *limatula* did not correspond precisely with the Type (which had lost the minute sculpture); Smith's figure, however, does seem to represent *tinctus*. Several P.F. shells, identified as *limatula* by Sowerby, are inseparable from *tinctus*. As Reeve's figure 106 (*tinctus*) has figure precedence over (and presumably antedates) figure 124 (*limatula*), *tinctus* is here adopted for this common South African species; and *limatula* is excluded from the fauna list.

Among the specimens identified as *limatula*, Sowerby failed to distinguish one specimen clearly showing the distinctive sculpture of *natalensis*, which had not then been described.

Sowerby also described two shells as *humilis* n.sp. The cotype of this, from off Cape St. Blaize, is in South African Museum (S. Afr. Mus. no. 14858). It is larger than the Type: length 17, alt. 19 mm. Sowerby did not compare his species with either *tinctus* or *limatula*. I am unable to distinguish this cotype from the specimens identified by Sowerby as *limatula*, or from *tinctus*; it is more subcircular (less elevated), and has more ribs than stated in the description (nearer 40 than 30), but the figure of the Type seems to show more than 30 ribs. Thiele's specimens, identified as *humilis*, also had over 30 ribs on a shell of 14 mm. alt.

Thiele's *Chlamys* sp., with very fine striae, is not a different species. These striae can be seen frequently, though not on all shells. Short striae occur between the lamellose growth-lines on the early part of the shell; later when the growth-lines become inconspicuous the striae are longer, parallel with the ribs in the middle part of the shell, but acutely oblique towards the lateral parts. Striae are present on the sides of the ribs, and sometimes may be seen on the top of the ribs when the squamae are feebly developed. Although not traceable on all shells, these striae seem to be a normal feature.

Smith's specimens apparently did not show these striae, and consequently he maintained *tinctus* as a species separate from *pusio* in which he said the striae were characteristic (1906).

Cox, however (1927, p. 42, pl. 7, fig. 6, and p. 96), stated that he could find no difference between *pusio* (Linn.) and *tinctus*; and said that the former existed in Lower Miocene times in the Mediterranean and Indian Ocean before these waters were separated, and occurred in the Zanzibar Pleistocene deposits; but appeared to have died out in the Indian Ocean except in the extreme south (i.e. South Africa: *tinctus*). Cox's description omits mention of any intercostal sculpture. In 1939 Cox recorded *pusio* from the Post Pliocene of Inhambane.

The South African Museum has only 4 valves from Cape Town; and the P.F. took only one worn valve in Table Bay (Lion's Head S.E. ¼ E., 32 miles, 126 fathoms). U.C.T. had no records from Oudekraal (west coast of Cape Peninsula); or from the west coast as far north as Port Nolloth, until recently (1962) when specimens were taken at Langebaan (Saldanha Bay).

Ch. tinctus appears to be a free-living species, not (as e.g. *distortus* da Costa) a fixed species.

Chlamys natalensis Smith

Fig. 14 *d*

?*Pecten squamosus* (*non* Gmelin), Sowerby, 1897, p. 28.
Chlamys natalensis Smith, 1906b, p. 60, pl. 8, figs. 7, 7*a*, 8, 8*a*; 1910, p. 213.
Pecten natalensis (Smith), Bartsch, 1915, p. 186; Turton, 1932, p. 222.

Distinguished from *tinctus* by the more regular ribs, which number 30–36 (S. Afr. Mus.)—40 (Smith); and the criss-cross sculpture in the grooves. This sculpture occurs in both valves, and is produced by 3–4(5) rows of more or less triangular squamulae arranged in quincunx (when the squamulae are blunt the sculpture appears pitted).

Early part of shell radiately finely striate, at 3–4 mm. alt. about 10 ribs, at 4–5 mm. intermediaries appear, at 5–6 mm. about 16–18 ribs, and the radial striation (in the grooves) gives place to the quincuncial squamulae. No concentric growth-lines except towards the margin in adult shell, more or less squamose, but not so strongly squamose as in typical *tinctus*. All the ribs are simple, undivided, and without subsidiaries.

Greyish (Smith); right valve cream, left dull pinkish (S. Afr. Mus.), purplish-brown, faintly mottled (single valve: S. Afr. Mus.); orange (Smith; also S. Afr. Mus.).

Length 20, alt. 23·5 mm. (Smith); 12·5 × 15, 19 × 22, and 22 × 27 mm. (S. Afr. Mus.).

Durban (Smith); Port Alfred (Bartsch, Turton).

Off Durnford Point (Zululand), 13 fathoms, one living and one valve; Cape Natal, 54 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. As a living species probably confined to Natal and Zululand; and even there it is a much rarer species than *tinctus*.

Presumably all the Port Alfred shells were dead.

Bartsch's locality 'Cape of Good Hope' is inexact, and should not be taken as a record of this species from anywhere in the south-west Cape Province.

Cox (1927, p. 43, pl. 7, figs. 5*a*, *b*) described and figured *tenuisculpta* from the Lower Miocene of Pemba Island. If it is considered desirable to synonymize fossil and recent species, this name may have to be replaced by *natalensis*; and perhaps both may be replaced by *kokeniana* Noetling 1901, which Cox said had the same intercostal ornamentation. When discussing palaeogeographical questions, however, it is sufficient to bear in mind the resemblance between the

Indian and Zanzibar fossils and the living Natal species, without crystallizing a definite synonymy.

The Mauritian species *crouchi* Smith 1892 has the whole surface covered with microscopic reticulations (Eames & Cox, 1956, p. 48).

Chlamys gilchristi Sow.

Chlamys gilchristi Sowerby, 1904, pl. 1, pl. 6, fig. 6.

Left valve slightly convex, 9 main ribs, slightly raised, and numerous granulose secondary riblets or lirae, one or two on each rib; interstices very finely radiately striate, growth-lines obscure except here and there. Right valve slightly more convex, ribs broader and flatter, lirae more strongly granulose on earlier part of shell, less so later, interstices striate, growth-lines more prominent near margin where they make the lirae foliate.

Right valve pinkish, left orange, both valves internally orange.

Length and altitude 35 mm., thickness (valves together) 8 mm. *Africana* specimens 27 and 32 mm. long.

Vasco da Gama (Cape Point) N. 71° E. $18\frac{1}{2}$ miles, 230 fathoms, one, April 1900 (Sowerby, P.F. coll.). 31° 14′ S., 16° 36′ E., 272 metres, two, 1947 (s.s. *Africana* No. AFR. 728, per U.C.T.).

Holotype in South African Museum (No. 14853).

Remarks. I have seen (1960) one specimen in coll. Mrs. H. Boswell, Pretoria, stated to have been taken off Cape Point.

Chlamys eucosmia (W. H. Turton)

Fig. 13 *b*

Pecten eucosmia Turton, 1932, p. 222, pl. 57, no. 1549.

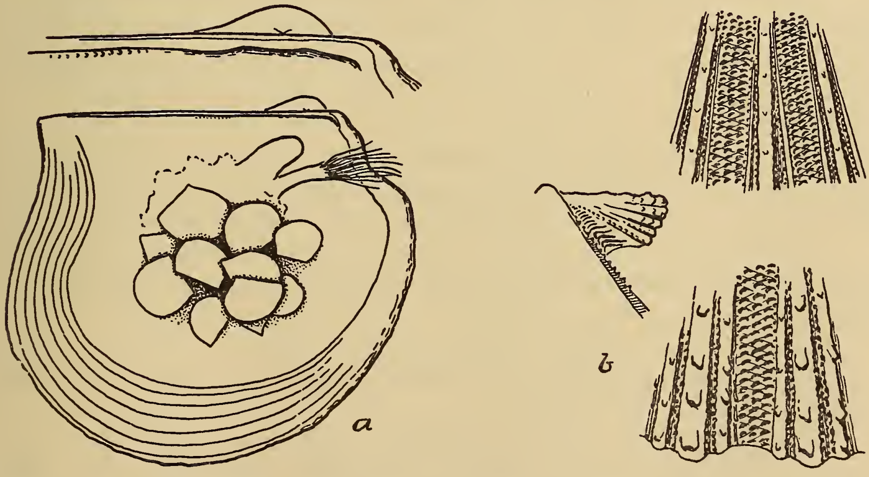


FIG. 13. *a*, *Pinctada* sp. Interior of left valve with juveniles; hinge-line further enlarged (S. Afr. Mus. no. A9488). *b*, *Chlamys eucosmia* (W. H. Turton). Sculpture at beginning of main rib accessories and at margin; right anterior ear.

Right valve slightly more convex than left. At 0·5 mm. alt. 8 ribs, increasing to 15 at 3 mm.; thereafter no more intermediaries, but at about 3–4 mm. alt. an accessory riblet on each side of rib, later two accessories. Main ribs and accessories with small, spaced squamulae. Ears costate, posterior ears less strongly so than anterior ears, anterior right ear also lamellose; criss-cross sculpture in the grooves except on the right anterior ear.

Grooves with criss-cross sculpture, beginning with 2–3 rows of pits at about where the intermediaries develop, later increasing to 6–7 rows, but reduced to 4–5 when the width of the groove decreases owing to the formation of accessories; pits near the rib smaller than those in the middle of the groove. In the grooves between main rib and accessories 1–2 rows of pits.

Length 12, alt. 13, thickness (valves together) 4·5 mm. Lemon yellow.

Umpangazi, Zululand, one living (U.C.T.).

Port Alfred, dead (? one only) (Turton).

Remarks. The present shell seems to be undoubtedly Turton's species described from an 8 × 8 mm. shell. His figure shows criss-cross sculpture on the right anterior ear, but in the present shell such sculpture is absent from this ear.

The species differs in shape and number of ribs from *natalensis.* It resembles *fultoni* in shape, but has 2–3 fewer ribs. It differs from both these species in having composite instead of simple ribs.

Chlamys fultoni Sow.

Fig. 14 *a*

Chlamys fultoni Sowerby, 1904, p. 2, pl. 6, fig. 5; Smith, 1906, p. 59.

Left and right valves almost equally convex, but in juvenile the right very slightly less convex. Ribs (16) 17, rounded, subequal in width to the grooves, ribs and grooves crossed by growth-lines which are very close, slightly lamellose on the ribs, chiefly on the lateral ones. Ears costate, anterior right ear also lamellose.

Grooves with extremely fine radiating striae, not always visible; on left valve grooves normally filled with tiny squamulae arranged in quincunx; on the right sometimes present, but usually not; sometimes only in the lateral grooves.

Purplish-brown, with irregular white or cream patches or zigzags or Λ-shaped marks, sometimes the brown sometimes the pale colouring predominating. One juvenile uniform orange.

Length 33, alt. 34, depth (valves together) 11 mm.

Off Amatikulu (Zululand), 26 fathoms (Sowerby, P.F. coll.) (erroneously quoted by Smith as 'off the Cape').

Off: Tugela River (Natal), 24 fathoms, 4 living; and 47 fathoms, valves; Umhloti, 40 fathoms, valves; Tongaat, 36 fathoms, 3 juv. living and valves; Morewood Cove, 27 fathoms, valves; Umkomaas, 13 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

31° 38′ S., 29° 34′ E., 26 fathoms, living (U.C.T.).
Delagoa Bay, one valve (S. Afr. Mus. coll. K.H.B.).
Port St. Johns, one worn valve (S. Afr. Mus.).
Cotype in South African Museum (No. 14970).

Remarks. The number of complete shells and single valves sent to Sowerby is not recorded. It seems strange that he did not notice the squamulae in the grooves. The cotype valve (with Sowerby's label) alt. 18 mm., shows the squamulae on the middle part, though they are absent from the lateral parts.

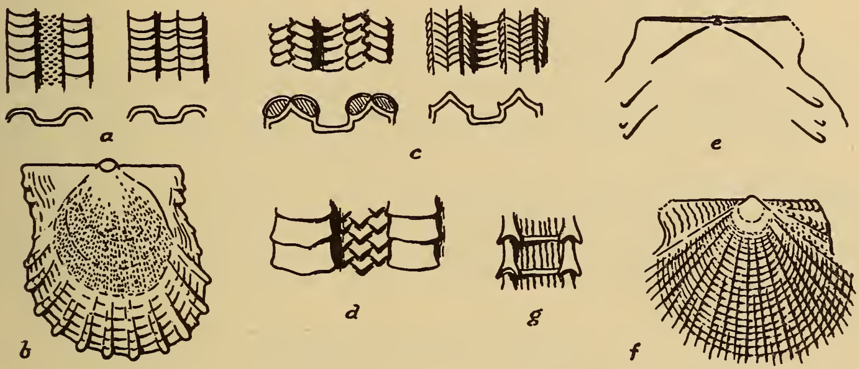


FIG. 14. *a, Chlamys fultoni* Sow. sculpture on left and right valves, with sections. *b, C. tinctus* (Rve.) juvenile 1·5 mm. alt. *c, C. bullatus* D. & B. sculpture of unworn (left) and worn (right) ribs, with sections. *d, C. natalensis* Smith sculpture. *e, f, g, Cyclopecten vidalensis* n.sp., portion of interior and exterior, with external sculpture further enlarged. The extremely fine striae on earliest part of shell (exterior) not shown.

The present material comprises: one large complete shell, 28 mm. alt., without squamulae in either valve; this is the only example in which the squamulae are absent from the left valve.

6 complete shells with squamulae on the left, none on the right valve; 28 left valves all with squamulae; 20 right valves without squamulae; 12 right valves with squamulae, sometimes present only in the lateral grooves.

Most of the right valves with squamulae are from off Morewood Cove, where there appears to be a colony with this somewhat unusual character (12 in 20 = 60%).

This species probably does not live far beyond the southern limit of Natal; the Port St. John's specimen is badly worn.

Chlamys bullatus D. & B.

Fig. 14 *c*

Pecten (*Chlamys*) *bullatus* Dautzenberg & Bavay, 1912, p. 17, pl. 27, figs. 1, 2 (poor).

Subcircular but slightly oblique, both valves convex. Ribs 17–18, each with 2 rows of squamae which fuse, forming 2 alternating series of vesicles;

grooves a little narrower than the ribs, with concentric lamellae. Ears with 4(5) ribs, grooves with growth-lines; the rib nearest the hinge on right anterior ear rather strongly lamellose.

Faint traces of rose and paler mottling.

Length 15, alt. 15, hinge-line 8·5 mm. (S. Afr. Mus.).

Off Tugela River (Natal), 47 fathoms, one valve; Umhloti, 40 fathoms, 7 valves and fragments; Cape Natal (Durban), 54 fathoms, 5 valves; Illovo, 27–30 fathoms, one valve; Cape Morgan, 52 fathoms, one very worn valve (S. Afr. Mus. P.F. coll.).

Distribution. East Indies.

Remarks. All the specimens are more or less worn. Only one valve shows clearly the peculiar 'bivesiculous' sculpture on the ribs; other valves in different stages of abrasion show the vesiculous ribs and the worn 'tripartite' ribs. A valve with only the latter sculpture might be mistaken for a different species.

There seems no doubt about the identification. Although the figure is useless, the original description is explicit: '. . . côtes recouvertes par des squamules élevées qui se rejoignent et se soudent entre elles au sommet de manière à former, de chaque côté, une rangée de vésicules disposées en séries alternantes. . . .' These words exactly express the distinctive sculpture on the present specimens.

Chlamys senatorius (Gmelin)

Ostrea senatorius Gmelin, 1790, p. 3327.
Pecten senatorius (Gmel.) and *crassicostatus* Sowerby, 1842, pl. 15, fig. 111, pl. 17, figs. 151, 152, pl. 18, figs. 188–192.
Pecten senatorius (Gmel.), Dautzenberg & Bavay, 1912, p. 4.
Chlamys senatorius (Gmel.), Cox, 1927, p. 45, pl. 7, figs. 1–3, p. 75, pl. 15, fig. 3, pl. 17, fig. 10; Nardini, 1937, p. 233, pl. 14 (8), fig. 4; Cox, 1939, p. 76, pl. 1, fig. 14.
[?] *Pecten tranquebaricus* (Lam.), Macnae & Kalk, 1958, p. 129.

Ribs 22–27, with small squamae at fairly regular intervals, squamae becoming stronger and closer together towards the margin in large shells; at about 20–25 mm. alt. a series of smaller squamae appears on either side of the ribs, which thus become tripartite; grooves smooth. Up to length 60, alt. 62 mm.

Violaceous, often with paler marks; interior violaceous, a broad submarginal bright orange zone, margin violaceous.

Fossil: Miocene, Pemba Island and Inhambane; Pliocene, Zanzibar and Inhambane.

False Bay in St. Lucia Bay (Zululand) (Nardini); Delagoa Bay and Mozambique Island (U.W.). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea, Madagascar, Mauritius, Indo-Pacific.

Chlamys plica (Linn.)

Pecten plica Linn., Sowerby, 1842, p. 65, pl. 20, figs. 237–239.
Chlamys plica (Linn.), Cox, 1929, p. 201; Nardini, 1937, p. 235, pl. 15 (9), fig. 2; Barnard, 1962b, p. 192 (listed *teste* Nardini).

Pliocene-Pleistocene: Red Sea, Kenya, Dar-es-Salaam.

Quaternary: False Bay in St. Lucia Bay (Zululand) (Nardini); Durban harbour sediments (Dr. Lester King, 1963).

Distribution (living). Red Sea, Ceylon, Nicobars, Maldives, Indo-Pacific.

Remarks. Nardini had three examples. Dr. Lester King obtained a number of single valves, all more or less worn, but some showing traces of irregular brown bands (cf. Sowerby, figs. 237 and 239).

Not recorded by recent collectors. Has the species become extinct along the Natal coast?

Palliolum vitreum (Chemn. Schröter)

Pecten vitreus (Chem. Schr.) Sars, 1878, p. 21, pl. 2, figs. 5 *a*, *b*.
Palliolum vitreum (Chem. Schr.) Verrill, 1897, p. 66, pl. 18, figs. 6–9, 9*a*, 10–12, 12*a*, 13.
Pecten alcocki Smith, 1904b, p. 13; 1907, pl. 18, figs. 4, 4 *a*, *b*.
Chlamys (*Palliolum*) *vitrea* (Chem. Schr.) Dautzenberg & Fischer, 1912, p. 333 (references).
Pecten (*Cyclopecten*) *vitreus* (Chem. Schr.) Dautzenberg & Bavay, 1912, p. 27 (references).
Pecten (*Pseudamussium*) *alcocki* Smith, Thiele, 1931, p. 164.

Equivalve, subcircular, thin, hyaline, posterior ear scarcely differentiated; minutely radiately striate, the striae interrupted by concentric growth-lines, minute squamulae more or less regularly disposed over the marginal area. White.

Length and latitude up to 18 mm. Verrill illustrated a shell of 20 mm.

Constable Hill (Saldanha Bay) E. ¾ S. 19 miles, 145 fathoms, one living, one dead but fresh; Lion's Head N. 67° E. 25 miles (off west coast of Cape Peninsula), 131–136 fathoms, one living; Cape Point E. 26 miles, 210 fathoms, one valve; Vasco da Gama (Cape Point) N. 71° E. 18 miles, 230 fathoms, 2 broken valves; off Cape Vidal (Zululand), 80–100 fathoms, one valve (S. Afr. Mus. P.F. coll.).

31° 39′ S., 16° 55′ E., 287 metres, two (s.s. *Africana* No. AFR. 707, per U.C.T.).

30° 20′ S., 30° 30′ E., 1,300 metres, one valve (Fisheries Survey, *Africana II*).

Distribution. North Atlantic to Morocco, Azores, Teneriffe, Mediterranean; east coast of North America; Patagonia and Magellan Strait; coast of East Africa (6° 18′ N., 49° 32′ E.), off South India, East Indies, Philippines, Japan. 37–4,255 metres.

Remarks. The South African specimens agree with the descriptions and figures of Sars and Verrill. Thiele was inclined to regard Smith's *alcocki* as merely a variety of *vitreum.*

The valve obtained by *Africana II* measures 26 × 26 mm. The concentric growth-lines up to length of 12 mm. are rather widely spaced (as in other specimens) and form low corrugations; thereafter they are closer together, especially near the margin.

Thiele (1931, p. 164) has identified, with some doubt, two shells from 35° 26′ S., 20° 56′ E., 80 metres, and 35° 9′ S., 18° 33′ E., 564 metres with the North Atlantic *Pseudamussium similis* (Laskey). The shell from the latter (South

African) locality measured 6·5 × 6 mm. I would suggest that these shells are more probably juveniles of *vitreum* and I exclude *P. similis* from the fauna list until better evidence is available.

Amussium texturatum D. & B.

Amussium texturatum Dautzenberg & Bavay, 1912, p. 37, pl. 27, figs. 19–22.

Agreeing with the description, but larger. Almost equivalve, but the right valve less convex than the left; in the living example the right valve is turned up at the margin (at 5·5 mm. alt. in a 6·5 mm. shell) to fit within the left valve; in the single valves the margin is not turned up, possibly broken or worn away. Concentric lamellae on left valve beginning at about 0·4 mm. alt., and 6–7 ribs at about 1 mm. alt., intermediaries at about 1·5–2 mm., at 4 mm. 11 ribs, at 8 mm. 21–24 ribs, not counting one or two very faint and short ones at the margin; at the intersections flat squamulae, more or less imbricate, especially near the margin where the growth lamellae are close together. Internal costae at 4 mm. alt. 10–11 (not counting the auricular crurae), at 8 mm. 19–21 (including short intermediaries).

Mostly white or buff, some left valves faintly pinkish, with or without opaque white specks, or with faint reddish blotches.

Length 9, alt. 8–8·5, hinge-line 5 mm.

Off Cape Vidal (Zululand), 50 fathoms, 2 valves; Durnford Point (Zululand), 90 fathoms, 3 valves; off Tugela River, 65–80 fathoms, one living, 4 valves; Tongaat, 36 fathoms, several valves; Cape Natal (Durban), 54–85 fathoms, numerous valves; off Cape Morgan, 77 fathoms, numerous valves (S. Afr. Mus. P.F. coll.).

Distribution. East Indies, 275 metres.

Remarks. I have no hesitation in identifying these shells with *texturatum*. The radial ribs on the left valve curve posteriorly (as in D. & B.'s fig. 19); the intermediaries are variable in development.

Single valves were numerous in the bottom samples from off Cape Natal and Cape Morgan, but the only living specimen was taken off the Tugela River.

Cyclopecten incubans n.sp.

Subcircular, thin, translucent, inequivalve, right valve smaller than left and slightly less convex, not flattened or turned up at margin, ears distinct, byssal sinus well marked; earliest part of right valve with extremely fine radial striae, later replaced by extremely fine and close concentric striae, radial ribs and (major) growth-lines very obscure, anterior ear obscurely ribbed, posterior ear concentrically lamellate, interior smooth. Left valve with concentric lamellae beginning at about 0·4–0·5 mm. alt., very fine radial ribs beginning at about 0·5–0·75 mm., and intermediaries almost immediately thereafter, at margin about 45–50 ribs, not very regularly spaced, often in pairs or 3–4 fine ones between two stronger ones, sculpture cancellate, but the concentric growth-lines often stronger than the ribs, especially on earlier part of the shell, intersections crenulate, scarcely squamulose except feebly so on posterior part; ears finely cancellate, the concentrics stronger than the radials; interior smooth with very shallow grooves corresponding with the external ribs, no radial costae, margin smooth. White, translucent.

Largest single valve: length 5, alt. 4·5 mm.; a double shell: left valve 4 × 3·5, right valve 3·3 × 3 mm.

The specimen from off Cape Point and one of the Cape St. Blaize examples contained bivalved juveniles, about 20 in the former, 15 in the latter. Minutely radially striate, hinge-line 0·3 mm.

Off Cape St. Blaize, 125 fathoms, 2 living and 8 valves (Types); Cape Point N.E. ½ N. 19 miles, 145 fathoms, one living (S. Afr. Mus. Nos. A9493 (Types), A9494. P.F. coll.).

34° 17′ S., 17° 53′ E., 320 metres, one living (U.C.T.).

Remarks. So far as I am aware incubation has not been recorded in the *Pectinidae*, though some species are known to be monoecious, others dioecious.

The radial ribbing on the left valve is variable, no two specimens being exactly alike.

Cyclopecten vidalensis n.sp.

Fig. 14 *e–g*

Left valve only—subcircular, moderately convex, anterior ear larger than posterior ear; concentric growth-lines showing at 0·5 mm. alt., about 10 ribs appear at 1 mm. alt., and intermediaries begin at 2 mm., about 45 ribs (main and intermediary) at margin of shell; ribs slightly stronger than the concentric lamellae, together forming a cancellate sculpture, intersections slightly nodular or squamulose, the latter chiefly on the lateral parts of the shell; earliest part with extremely fine radial striae which later become stronger and clearly visible in the hollows of the lattice sculpture; ears with concentric lamellae. Internally hinge narrow, a small ligament pit, crurae well marked but without ridge or denticle, no radial costae except 2 short costae and a denticle between them anteriorly and posteriorly, margin smooth. Dull buff (opaque).

Length and alt. 7·5, hinge-line (chipped) 4 or 4·5 mm.

Off Cape Vidal (Zululand), 80–100 fathoms, one valve (S. Afr. Mus. No. A9495. P.F. coll.).

Remarks. Provisionally placed in *Cyclopecten*; but if this valve is juvenile, older shells might show better developed internal costae, which would indicate removal into another genus.

Fam. **Spondylidae**

Watson, 1930a, pp. 25–31, and 1930b, pp. 31–36 (anatomy).

Plicatula plicata (Linn.)

Plicatula ramosa Lam., Sowerby, 1847, p. 435, pl. 90, figs. 1–4; Chenu, 1862, fig. 975.
Plicatula imbricata Menke, Sowerby, 1847, p. 437, pl. 90, fig. 6, pl. 91, figs. 15–18.
Plicatula plicata (Linn.), Nardini, 1937, p. 228, pl. 13(7), figs. 2–5.

Ribs not very numerous, approximately as wide as the grooves, not squamose.

Off O'Neil Peak (Zululand), 90 fathoms, 7 dead valves (S. Afr. Mus. P.F. coll.). Fish Hoek (False Bay), one dead valve; and Still Bay, one valve (Mrs. Connolly).

Distribution. Red Sea, East Africa, Madagascar, Mauritius.

Plicatula squamosissima Smith

? *Plicatula australis* (*non* Lam.), Krauss, 1848, p. 30.
Plicatula squamosissima Smith, 1899, p. 251, pl. 5, figs. 15, 16; Turton, 1932, p. 222.

Ribs numerous, narrow, and close together, imbricately squamose, as are also the very narrow grooves.

Dirty white or grey, with small black spots and radial streaks; interior brownish, with some darker spots.

Umkomaas, Natal (Smith); Natal (S. Afr. Mus.); Umzikaba, north of Port St. Johns, living (S. Afr. Mus.); Port Alfred, dead (Bartsch, Turton).

Remarks. For discussion as to status of *australis* Lam., *australis* Krauss, and *multiplicata* Desh. see: von Martens (1880, p. 313), Lynge (1909, p. 153), Lamy (1918, p. 513), Prashad (1932, p. 115) and Iredale (1939, p. 380).

Smith's name will probably become a synonym, but for the present is retained.

Spondylus hystrix Röding

Spondylus hystrix Röding, 1798, p. 195; Adam & Leloup, 1939, p. 60, pl. 4, fig. 5; Day & Morgans, 1956, p. 308; Macnae & Kalk, 1958, p. 129.
Spondylus nicobaricus Sowerby, 1847, pl. 88, fig. 48.
Chama nicobaricus (Sow.), Turton, 1932, p. 234.
Spondylus ciliatus Sowerby, 1847, pl. 89, fig. 52.
Spondylus sp. Turton, 1932. p. 234, pl. 61, no. 1636 (= juv.).

Fossil: Post Pliocene, Inhambane (Cox, 1939).

Port Alfred, dead (Turton); Umgazana, Port St. Johns, living (U.C.T.); Port St. Johns, one dead but valves united (S. Afr. Mus.); Umzikaba, north of Port St. Johns (S. Afr. Mus. coll. F. H. Talbot); Scottburgh, Natal, 4 valves (S. Afr. Mus. coll. K.H.B.); Durban, living (U.C.T.); Delagoa Bay, living (U.W.).

Off O'Neil Peak (Zululand), 90 fathoms, one very worn valve; Umhloti (Natal), 40 fathoms, 4 valves; Cape Point N.W. × W. $\frac{1}{2}$ N. 8 miles, 45 fathoms (mouth of False Bay) one broken and worn valve (S. Afr. Mus. P.F. coll.).

Distribution. Mauritius, Madagascar, Indo-Pacific.

Remarks. The occurrence of even a worn valve in the mouth of False Bay is unexpected, and the record should be accepted with reserve (but see † *Spondylus* sp., *infra*).

The condition of the Port St. Johns shell (S. Afr. Mus. A6649) indicates that it had lived in the neighbourhood. Both valves are intact but open, and barnacles have settled on the inside of both valves. Port St. Johns should probably be reckoned as the utmost southerly limit at which *Spondylus* lives on our coast.

Cox (1927, p. 49, pl. 7, figs. 7, 8 *a*, *b*) recorded *ornatissimus* Böhm from the Lower Miocene of Pemba Island, remarking that no other species 'either living or fossil, is so delicately ornamented'. This seems an exaggeration, because some of the present valves assigned by Tomlin to *hystrix* (*nicobaricus* and *ciliatus*) are ornamented as in Cox's fig. 8*b*. From the Pliocene of Zanzibar *insularis* n.sp. was described (p. 80, pl. 16, fig. 4); this also seems to have a very similar ornamentation. In both cases the figures are good and allow a critical comparison; nevertheless it is always preferable to compare actual specimens.

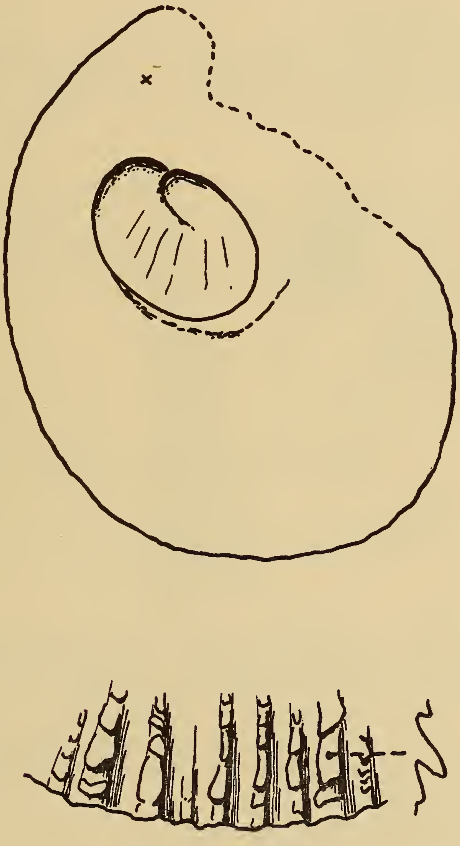


FIG. 15. †*Spondylus* sp. Valve 150 × 120 mm., thickness at × 8 mm. Portion of margin, with profile of one rib.

Sowerby (1897, p. 28) recorded also *S. ducalis* Chemn. from Natal. The shell (if it was really a South African shell) was probably the same as the specimens recorded as *hystrix*; the latter and its varieties and *ducalis* being difficult to distinguish (Prashad, 1932, p. 111).

The right valve of the Port St. Johns specimen (S. Afr. Mus. A6649) has a very long 'beak' at the hinge, 20 mm. in a total altitude of 63 mm.

† *Spondylus* sp.

Fig. 15

Spondylus sp., Barnard, 1962b, p. 184.

A large flat valve appears to be the left valve of a *Spondylus*. Unfortunately the hinge was broken away in extracting the shell from the deposit, and no attempt was made to obtain it; at least it was not submitted to the South African Museum.

The outer surface has numerous radiating squamose ridges; the squamae are blunt, more or less square-ended; but, even allowing for abrasion, not spiniform. Colour dull orange. 150 × 120, thickness at x in figure 8 mm.

Limestone deposits, Klein River, Stanford. See: Wybergh, 1920, p. 58; and Krige, A.V. 1927, p. 51.

Fam. **Limidae**

Thiele, 1918–1920, pp. 1–66, pls. 1–10.

Synopsis of South African species

I. Inequilateral (oblique)
  A. Anterior and posterior ears more or less equal
    1. Median ligament pit wider than high. A deep pit in posterior ear below hinge-line.
      (*a*) Ventricose .. .. *rotundata*
      (*b*) Flat .. .. *fragilis*
    2. Median ligament pit higher than wide. No pit on posterior ear.
      (*a*) Ribs squamose; grooves more or less punctate .. .. .. *lima*
      (*b*) Ribs nodulose; grooves with concentric growth-lines only .. .. *perfecta*
      (*c*) Ribs very fine, divaricating .. .. *divaricata*
  B. Posterior ear incurved, not visible in surface view. Ribs very fine, divaricating *abscisa*
II. Equilateral (symmetrical)
  A. Altitude slightly greater than length .. .. *symmetrica*
  B. Altitude much greater than length .. .. (*Limatula*) *agulhasensis*

From Gough Island, 180 metres, outside the strictly South African region, Melvill & Standen (1907) described *Lima* (*Mantellum*) *goughensis*.

Lima rotundata Sow.

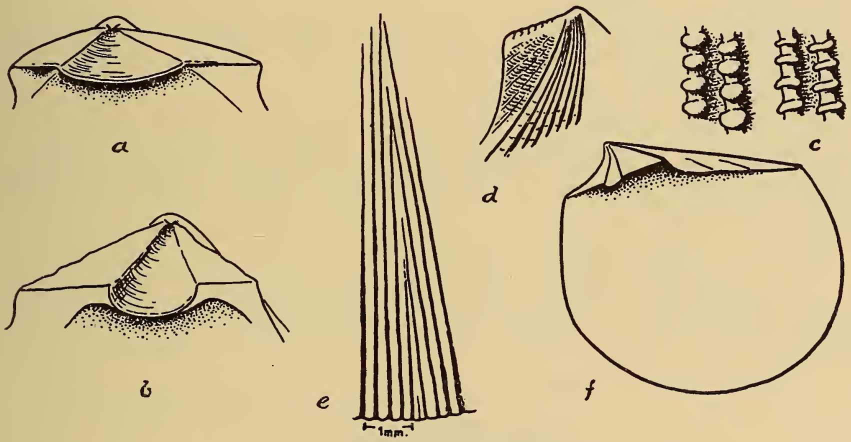
Fig. 16 *a*

Lima rotundata Sowerby, 1843, p. 86, pl. 21, fig. 19; Krauss, 1848, p. 29 (quoted reference to Sowerby as 'pl. 22, figs. 39, 40', which is *angulata*); Sowerby, 1892, p. 66; Johnson, 1904, p. 11; Smith in Rogers, 1906c, p. 294; Schwarz, 1910, p. 116; Thiele, 1920, p. 27, pl. 4, fig. 8; Turton, 1932, p. 223; Day, 1959, p. 538.

Lima hians var. *tenera* Turton (*non tenera* Chemn.) Sowerby, 1897, p. 28.

Lima africana Bartsch, 1915, p. 186, pl. 38, fig. 4; Turton, 1932, p. 223.
Lima angulata (*non* Sow.), Thiele, 1931, p. 166.
Lima subventricosa Turton, 1932, p. 223, pl. 57, no. 1558.
Lima rufanensis Turton, 1932, p. 223, pl. 57, no. 1559.

Oblique, ventricose, slightly gaping posteriorly, more so anteriorly; median ligament pit wider than the lateral portions, twice as wide as high, a deep pit below the hinge-line on the posterior ear. Prodissoconch smooth, glossy. Radial ribs beginning at about 1 mm. altitude, about 10–12 on middle part of shell, at 10 mm. altitude about 17–20, increasing in large shells to *c.* 30–35; anterior and posterior ears with finer riblets, which are not included in the above numbers; ribs mostly smooth on early part, but becoming more or less nodulose later. Grooves with fine concentric growth-lines.



VIG. 16. *a*, *b*, Hinge (left valves) of *Lima rotundata* Sow. and *L. lima* (Linn.). *c*, *L. perfecta* Smith Fariations of nodules on ribs. *d*, *L. lima* (Linn.) posterior ear. *e*, *L. divaricata* n.sp. divaricating riblets (semidiagrammatic). *f*, *L. abscisa* n.sp. internal view of right valve.

White or cream. Animal orange-scarlet.

Length (greatest, parallel with hinge-line) 37. alt. 42, thickness (one valve) 15, hinge-line 20 mm.

No eyes. Inner mantle fringe wide, the two sides anteriorly united; lips fused into a transverse tube open at both ends; foot with byssus groove, but no byssus; no retractors.

Fossil: Pleistocene, Port Elizabeth (Johnson, Schwarz); Little Brak River, Mossel Bay (Smith); Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.).

Port Elizabeth and Algoa Bay (Krauss, Sowerby, Thiele); Port Alfred (Bartsch, Turton); False Bay, Still Bay, Mossel Bay, Port Alfred (S. Afr. Mus.).

False Bay, 20 fathoms, juv. valves; off East London, 27 fathoms, 9 valves (S. Afr. Mus. P.F. coll.).

Saldanha Bay; False Bay; Algoa Bay (U.C.T.).

Remarks. Krauss named his specimens *rotundata*, but gave a reference to Sowerby's figures of *angulata.*

Sowerby identified some small P.F. specimens from False Bay as *hians* var. *tenera*, probably having in mind his 1897 record of this species; but they are obviously only juvenile *rotundata*, which is common in that locality; the identity is shown by a long sequence of shells collected by Dr. Muir at Still Bay.

Port Alfred specimens received from Turton as *africana* are also only juvenile *rotundata.* Bartsch included in his rib-count (50) *all* the ribs, which perhaps is logical, though the ribs on the ears near the hinge-line are often inconspicuous. The number of ribs is variable.

The length/altitude ratio varies, as is shown e.g. by the following pairs: length 13 × alt. 13·5 and 13 × 15·5 mm.; 24 × 28 and 28 × 28 mm.; 26 × 30 and 30 × 30 mm.

The degree of obliquity and inflation are also variable. Old shells are relatively more ventricose than juveniles, but young shells vary in this respect, e.g. alt. 15, thickness 4 mm. and 15 × 6 mm.

The height of the median ligament pit also appears to be variable, if only beach-worn valves are examined; the lower margin of the pit, however, is rather prominent and liable to abrasion. Turton's single 8 mm. shell called *rufanensis* is probably an aberration in this respect.

The most easterly locality is East London.

Thiele (1920) stated the nearest relative to be the Mediterranean and Atlantic *inflata* (Chemn.), but that he had South African shells which were scarcely distinguishable from European shells. In 1931 he identified an Algoa Bay valve as the Pacific *angulata.*

Lima fragilis (Chemn.)

Lima fragilis (Chem.), Sowerby, 1843, p. 86, pl. 22, figs. 34–37; Pelseneer, 1911, p. 33, figs. 1, 3, 9 (anatomy); Thiele, 1918–20, p. 34, pl. 1, fig. 2, pl. 6, fig. 4; Prashad, 1932, p. 124 (references).

Lima arcuata (*non* Sow.), Turton, 1932, p. 223; Macnae & Kalk, 1958, p. 37.

Thin, oblique, elongate-oval, ears angulate, especially the posterior ear, gaping anteriorly and posteriorly; median ligament pit wider than high, a deep pit below the hinge-line on posterior ear. Prodissoconch smooth, glossy. Radial ribs beginning at 1·5–2 mm. alt., numerous, increasing by interpolation to 40–50 or more, slender, filiform, non-squamose, ears with growth-lines but no radial ribs (or a few obscure ones on posterior ear). Grooves with growth-lines only. Internally the posterior margin formed by a thickened rib.

Length (greatest) 27, alt. 37, thickness (one valve) 3, hinge-line 11 mm.

Semitranslucent white. Animal scarlet.

Fossil: Pleistocene, limestone deposit, Klein River estuary, Hermanus (S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin).

Port Alfred, one valve (Turton); Still Bay, one valve (S. Afr. Mus. coll. Muir); Natal (S. Afr. Mus.); Delagoa Bay (U.W.).

Off Cape Natal (Durban), 54 fathoms, 3 valves (S. Afr. Mus. P.F. coll.).
29° 30′ S., 31° 23′ E., 68 metres (*Africana*, per U.C.T.).
Distribution. Indo-Pacific.

Lima lima (Linn.)

Fig. 16 *b*, *d*

Lima squamosa Lam., Sowerby, 1843, p. 84, pl. 21, figs. 1, 18; Sowerby, 1897, p. 28.
Lima multicostata Sowerby, 1892, p. 66; Schwarz, 1910, p. 116.
Lima lima (Linn.), Thiele, 1918–20, p. 13, pl. 1, fig. 3; pl. 2, figs. 1, 11–13; Cox, 1927, p. 79, pl. 16, fig. 2; Prashad, 1932, p. 119, pl. 3, figs. 23, 24 (references); Macnae & Kalk, 1958, p. 129; Kalk, 1958, pp. 214, 236.

Oblique, ventricose, slightly gaping anteriorly and posteriorly; median ligament pit higher than wide, one or two obscure granules or a small pit on the anterior and posterior ears. Radial ribs *c.* 18–20 on early part of shell, increasing to 25–30 (ribs on ears not included), more or less strongly squamose; anterior and posterior ears with radial riblets, better marked on the posterior ear, crossed by numerous close-set concentric (vertical to the margin) costulae. Grooves on early part with concentric growth-lines, later becoming more or less oblique, appearing criss-cross punctate, but near the margin of the largest shell becoming again concentric.

Length 20, alt. 25, thickness (one valve), 5, hinge-line 8 mm.

Fossil: Pliocene, Zanzibar; Pleistocene, Port Elizabeth (Schwarz).

Natal (Sowerby); Tongaat, Natal, beach worn (S. Afr. Mus.); Delagoa Bay (U.W.).

Off Port Shepstone, 24 fathoms (U.C.T.).

Off O'Neil Peak (Zululand), 90 fathoms, one valve; off Tugela River, 47 and 65–80 fathoms, 4 valves; off Cape Natal (Durban), 54 fathoms, 4 valves; Off Itongazi, 25 fathoms, one valve; off Umkomaas (Natal), 40 fathoms, 4 valves; off Cape Morgan, 47 fathoms, 4 valves (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, Madagascar, Indo-Pacific.

Remarks. Iredale (1939) mentioned (not well shown in his figure) the sculpture on the posterior area (ear) of his *persquamifer* (the Australian form of *lima-squamosa*), and also stated that the grooves between the ribs were 'practically smooth'. In the works available here neither of these two features is mentioned. The criss-cross pitting in the grooves is very clear in some of the present valves.

The P.F. obtained only single valves, but none of them is very worn; even the Cape Morgan example retains the squamae on the marginal area. None of them is so strongly squamose as in Sowerby's or Prashad's figures.

The species probably lives as far south as the Natal coast but not very much farther south.

Macnae & Kalk (1958) list *lima*, but in the text (p. 37) they refer to the habitat of *arcuata*; Kalk (1958) also mentions only *lima*.

Sowerby's 1892 record of *multicostata* was based on 'a specimen in the

Bairstow collection', which, however, does not necessarily denote Port Elizabeth as the locality where the shell was found.

Whether the Mediterranean and Indo-Pacific forms are conspecific seems to be still debated; and also whether the range in variation of the number of ribs should include *multicostata*.

Turton's *kowiensis* is obviously a juvenile, but without examining the ligament pit, no clue to its identity can be obtained.

Lima perfecta Smith

Fig. 16 *c*

Lima perfecta Smith, 1904a, p. 43, pl. 3, fig. 29; Thiele, 1918, p. 18, pl. 3, figs. 10, 11.

Very oblique, strongly ventricose; median ligament pit higher than wide, a small pit (or a granule) on the anterior and posterior ears. Radial ribs 20–21, strongly squamose, the squamae thick (but variable), nodulose, scarcely hollowed on the distal side in adult, but definitely hollowed in juveniles, wider than the ribs which are thus moniliform; ears with nodulose riblets. Grooves with close-set concentric growth-lines.

Length 11, alt. 13, thickness (one valve) 5, hinge-line 4 mm.; another shell: 11 × 12 × 4 × 3·5 mm. Smith: 12 × 15 × 10 (valves together) mm.

Port Alfred (Smith, Bartsch, Turton).

Off Sandy Point (north of Cape Morgan), 51 fathoms, 2 juv. valves; off Cape Morgan, 47 fathoms, 6 valves; off Hood Point (East London), 49 fathoms, 3 valves; off Nieca River (East London), 43 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. The valves from the P.F. bottom-samples exhibit the characteristic nodules on the ribs.

Smith gave the number of ribs as about 18, but his figure seems to indicate more (20), exclusive of those on the ears.

Lima divaricata n.sp.

Fig. 16 *e*

Oblique, ovoid; median ligament pit higher than wide, a feeble granule on each ear on left valve, and a slight ridge on the right valve, the ridge on the anterior ear better developed. Radial riblets numerous, fine, smooth, 4 to 1 mm. in middle of ventral margin, divaricating at a narrow acute angle in middle line; ears with a few obscure, broader radial riblets. Grooves too narrow to show any sculpture. Main concentric growth-lines at intervals, but not at all prominent. Surface near umbones slightly quincuncial in appearance, due to wear.

Length 13, alt. 15, thickness (one valve) 3, hinge-line 5·5 mm.

No trace of colour bands.

Off O'Neil Peak (Zululand), 90 fathoms, 2 valves (Types); off Cape

Natal (Durban), 85 fathoms, one worn valve (S. Afr. Mus. A9501 (Types) and A9502 P.F. coll.).

Remarks. These valves have no expanded ear as in the Australian *alata* Hedley; they are more oblique than in the Indo-Pacific *dunkeri* Smith; they are nearest to the Chinese *concentrica* Sow., but have no raised concentric lirae. The institution of a n.sp. seems advisable.

Lima abscisa n.sp.

Fig. 16*f*

Semitranslucent, inequilateral, upper part of hind margin straight, incurved, anterior margin nearly straight, ventral margin broadly rounded. Ligament pit high and narrow. Numerous very fine radial riblets, divaricating in middle line, about 12 to 1 mm. in middle of ventral margin. Two feeble and obscure radial riblets on posterior ear. Main concentric growth-lines traceable, but not prominent.

Length 5·5, alt. 5·5, thickness (one valve) 1, hinge-line 1·75 mm.

Off Cape Morgan, 47 fathoms, 3 valves (Types); off Tugela River (Natal), 65–80 fathoms, 2 valves (S. Afr. Mus. No. A9504 (Types) and A9505 P.F. coll.).

Remarks. Similar to the Australian *sydneyensis* Hedley 1904 (see: Thiele, 1918, p. 15, pl. 3, figs. 1, 2) but differing in shape, as is indicated by the measurements (*sydneyensis*: 6 × 8 mm.). Both species are axe-head shaped (Hedley); though it is the flat upper posterior margin (the back of the axe) which appears cut-off.

Lima symmetrica n.sp.

Equilateral, ears equal; median ligament pit as wide as high (equilateral), narrower than lateral portions; upper part of anterior margin formed by a thickened rib, ending in a denticle. Exceedingly fine radial riblets, 8–9 in 1 mm., not divaricating (except feebly in the lower third), non-squamose; anterior ear with radial riblets, posterior ear with growth-lines obscuring the radial riblets. Main growth-lines traceable at intervals, but not at all prominent.

Surface near the umbo with slight quincuncial appearance.

Length 13, alt. 15, thickness (one valve) 3, hinge-line 5·5 mm.

Off Cape Vidal (Zululand) 80–100 fathoms, one valve (S. Afr. Mus. No. A9503 P.F. coll.).

Remarks. The valve is almost symmetrical, and owing to the obscurity of the adductor scar, the anterior and posterior margins are not to be determined with certainty; one margin is slightly more curved than the other, and the latter being thickened above, is considered to be the anterior margin.

Lima (*Limatula*) *agulhasensis* Thiele

Lima (*Limatula*) *agulhasensis* Thiele, 1920, p. 48, pl. 9, fig. 12; 1931, p. 167; Barnard, 1963c, p. 15.
Lima (*Limatula*) *exigua* Thiele, 1920, p. 48, pl. 9, fig. 13; 1931, p. 168.
Lima (*Limatula*) *densecostata* Thiele, 1920, p. 49, pl. 9, fig. 14; 1931, p. 167.

Symmetrical, or sometimes very slightly oblique, ears not marked off by a concave margin (or sometimes a very slight concavity). Ligament pit subequal in width (at the hinge-line) to the area on either side of it. Numerous radial riblets, 4–5 or 6 to 1 mm. at an altitude to *c.* 4·5 mm., with or without interpolated riblets, becoming slightly nodulose towards the ventral margin in the larger shells. Fine concentric growth-lines visible in the grooves (except when they are very narrow owing to interpolated riblets).

Up to length 5·5, alt. 9, thickness (one valve) 2·5 mm.

35° 06′ S., 22° 26′ E., 155 metres (*agulhasensis* & *densecostata*); 34° 51′ S., 19° 37′ E., 80 metres, 35° 26′ S., 20° 56′ E., 80 metres (*exigua*) (Thiele).

Off Cape St. Blaize, 125 fathoms, 6 valves; Algoa Bay, 52 fathoms, 10 valves; off Sandy Point (north of Cape Morgan), 51 fathoms, 2 valves; off Umkomaas (Natal), 40 fathoms, 4 valves; off Illovo, 27–30 fathoms, 2 valves; off Cape Natal (Durban), 85 fathoms, one valve; off Tugela River, 47 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. With the specimens at hand, some of them from a locality not far removed from the *Valdivia* localities, there is difficulty in distinguishing more than one species. As Thiele did not give the thickness (crassitude) of the shells, nor any apical or lateral views, the distinction between 'mässig gewölbt' and 'starck gewölbt' is difficult to assess. The figure of *exigua* scarcely conforms with the description 'deutlich schief'.

The riblets are variable. Interpolated riblets occur, and when they do occur they may be either completely or partially separated from the neighbouring riblets; a main riblet may appear double (two adnate riblets of equal strength). Specimens with more, and specimens with less densely crowded riblets are found together in the same locality (e.g. Cape St. Blaize and Algoa Bay). The Natal specimens have the riblets less dense, and do not appear to be prone to interpolating extra riblets.

The largest specimen is from off the Tugela River.

Fam. **Anomiidae**

Winckworth, 1922, pp. 32–34, pl. 1.

From a preliminary examination of the living material obtained by U.C.T., the three genera mentioned by Winckworth are represented.

Gills W-shaped.	
3 distinct muscle scars	*Anomia*
2 muscle scars, separate or contiguous	*Monia*
Gills ∩-shaped; right gill shorter than left. Two contiguous muscle scars	*Heteranomia*

South African Museum has: upper (left) valves of *A. ephippium* Linn. from 'South Africa' (probably Table Bay or False Bay); also as Quaternary fossils from Sedgefield near Knysna (A. R. H. Martin);

Greenish valves of *Monia squama* (Gmelin) from Table Bay, Still Bay, Mossel Bay.

Turton's (1932) identifications and 'n.spp.' cannot be accepted for inclusion in the fauna-list. His *Saxicava rufanensis* may be an Anomiid.

U.C.T. has taken *Heteranomia* cf. *squamula* Linn. at 33° 48′ S., 25° 47′ E., 27 metres; and *Monia* cf. *squama* Gmelin at Arniston, Still Bay, Mossel Bay, Storms River, and Knysna.

Fam. **Ostreidae**

Orton, 1928; Thomson, 1954; Korringa, 1956.

Korringa's investigations at Knysna seem to have disentangled the taxonomy of the two or three South African oysters which are of commercial importance.

He recognized three species: *Ostrea algoensis*, *O. atherstonei*, and *Crassostrea margaritacea*. The second of these was originally described as a Quaternary fossil, and it is questionable whether a name applied to a fossil shell should be applied also to a living species. In the taxonomy of this family conchology plays a subordinate role as opposed to anatomy and physiology. The shell named *atherstonei* may appear conchologically to be an *Ostrea*, but, to be strictly scientific, we can never know whether it was larviparous or oviparous, and therefore an *Ostrea* or a *Crassostrea*. Its name should be † *Gryphaea atherstonei* (Newton).*

The living large Red Oyster, which Korringa identified as *atherstonei*, is thus bereft of a specific name. Korringa was convinced that it was specifically distinct from the small 'weed oyster' *algoensis* (p. 38). Further research may or may not confirm this. In the meantime I refer to the Red Oyster as *Ostrea* sp. (cf. † *Gryphaea atherstonei*).

Korringa examined the Saldanha Bay shells and considered them to be *atherstonei*. He did not discuss the fossil shells from the diamondiferous areas farther north, but said (p. 39) 'Maybe oysters really occur in that forbidden area [mouth of the Orange River]. If so, in all probability it will be *Ostrea atherstonei*'. The fossil oysters from that area, recorded and figured by Haughton (1932) as *prismatica*, were, however rostrate, sometimes strongly rostrate; and in that respect unlike *atherstonei* (Barnard, 1962b, p. 184).

Discussions, however, about the identity of fossil oysters (e.g. Cox, 1927, and Haughton, 1929, p. 37) are inconclusive. Therefore the shells recorded from the west coast as *Ostrea prismatica* (and typ. err. *imbricata*) (Haughton, 1929, 1932) are not considered here, although they appear to be *margaritacea*.

By a wise decision the generic name *Gryphaea* is henceforth to be used only for fossil oysters (Opinion 338, Intern. Comm. Zool. Nomencl. 1955).

Ranson's ignorance of the South African oyster fauna and his consequent vacillations in identifying specimens (Korringa, p. 37), and his 'fantastic hypotheses' (Korringa, p. 39) as to the source whence South Africa's oyster population is maintained, impair the value of his work.

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* Korringa (p. 38) said he saw in the South African Museum 'several fine specimens of *Ostrea atherstonei* classified under a variety of names'. This is not quite correct. At the time of his visit the only *named* specimens in the Oyster Exhibit were specimens of *hyotis* and *cucullata*, neither of which could possibly be mistaken for *atherstonei*. Maybe he meant 'from various localities'.

Gen. Ostrea Linn.

Hermaphrodite (*Monoeciostrea* Orton). Eggs relatively large. Larviparous, i.e. the eggs are fertilized and incubated within the mantle. No promyal cavity. Suprabranchial chamber large.

Fixed (left) valve without umbonal cavity; with chalky deposits below the gills and suprabranchial chamber (such deposits also in the flat (right) valve in old shells) (Korringa, pl. 13, fig. 2). 'Catch' area of adductor muscle forming more than 50 per cent of the scar. Upper valve with denticles (granules) on either side of hinge, fitting into pits on lower valve.

Prodissoconch with 2 grooves at each end of the hinge (provinculum), internal ligament below hinge or at its anterior end (Ranson, 1951, fig. 7).

Ostrea algoensis Sow.

Ostrea algoensis Sowerby in Reeve, 1871, pl. 26, fig. 65; Korringa, 1956, pp. 35 et sqq., pl. 14, fig. 2, pl. 16, fig. 2 (left).

Ostrea stentina Ranson, 1951, pp. 9, 10, 18, text-fig. 7 (prodissoconch).

Surface of flat valve smooth. Upper valve with a series of marginal denticles near the hinge, fitting into pits on lower valve. Adductor muscle scar oblique and lying wholly on posterior side of middle line drawn from the ligament. Larval shell nearly symmetrical (equivalve).

Yellowish-grey, sometimes with broad dark purple or blackish radial stripes on flat valve; both valves internally faintly greenish-grey.

Algoa Bay (Sowerby); Knysna (Korringa); False Bay (S. Afr. Mus.) 34° 23′ S., 18° 41′ E., 88 metres (s.s. *Africana* per U.C.T.).

Remarks. A small-sized species, scarcely exceeding two inches; and slow growing. Regarded by Korringa as a 'weed' oyster, not worth cultivation. Spawns in December and early January.

'Ranson presumes that *algoensis* may be identical with the widespread *Ostrea stentina* Payraudeau' (Korringa, p. 36).

Ostrea sp. (cf. † *Gryphaea atherstonei* (Newton))

References to the fossil *atherstonei*:

Ostrea atherstonei Newton, 1913, p. 327, text-fig. and pl. 17, figs. 1, 2, pl. 18, fig. 1; Haughton, 1932, pp. 34, 42.

Ostrea redhousiensis Newton, 1913, p. 329, pl. 18, fig. 2.

References to the living Red Oyster:

Ostrea margaritacea (*non* Lam.), Ranson, 1951, p. 4, text-figs. 4, 5, pp. 17, 19.

Ostrea cf. *atherstonei* Newton, Korringa, 1956, pp. 37 et sqq., pl. 16, figs. 1, 2 (right).

Surface of flat valve rough, scaly, imbricate. Marginal denticles and pits often indistinct in large shells. Adductor muscle scar nearly central and nearly parallel with the hinge-line.

Flat valve vinous red, without stripes, lower valve pinkish; internally pinkish.

Fossil: (*atherstonei*): Late Tertiary, Zwartkops River valley, Port Elizabeth (Newton, Haughton); Klein Brak River, Mossel Bay (S. Afr. Mus. coll. Haughton).

Saldanha Bay (Korringa); Knysna, Keurbooms River lagoon (Korringa; also S. Afr. Mus.); False Bay (S. Afr. Mus.; also U.C.T.).

Remarks. The Red oyster lives below low water of spring tides.

Korringa regarded dark radial stripes on the flat valve as characteristic of the small *algoensis*. There is, however, a pear-shaped flat valve, 105 mm. altitude (S. Afr. Mus. A6167. coll. Haughton, 1920) from Saldanha Bay with a somewhat oblique muscle scar, and externally about 10 violaceous stripes of varying width. Should this be regarded as a large *algoensis*, or a striped '*atherstonei*'?

This raises a doubt whether the position and obliquity of the muscle scar (Korringa, pl. 16, fig. 2) is always a reliable distinction between these two species; variability in the shape of the shell sometimes makes it difficult to decide exactly where the middle line runs.

A very flat and smooth specimen was removed from the supply tank at the St. James Marine Biological Station (now demolished) on 10 November 1911. The tank had been emptied and cleaned 3 months earlier. The oyster had grown to a length (i.e. altitude) of 50 mm. in 3 months or less.

Cox (1939, pp. 67, 82) identified Pliocene specimens from Morrumbene (Inhambane) as cf. *atherstonei*, stating that they did not appear to be referable to any species known to be living off the African coast.

Gen. CRASSOSTREA Sacco

Sexes separate (*Dioeciostrea* Orton). Eggs relatively small. Oviparous, i.e. the eggs are shed direct into the sea and there fertilized. Promyal cavity present. Suprabranchial chamber small.

Fixed valve with umbonal cavity; without chalky deposits below the gills and suprabranchial chamber. The presence of a promyal cavity displaces the adductor muscle towards the distal margin (Korringa, p. 13, fig. 1). 'Catch' area of the muscle forming less than 30 per cent of the scar.

Prodissoconch with 2 grooves at each end of provinculum, internal ligament anterior, a little distance from the provinculum (Ranson, 1951, fig. 1).

Crassostrea margaritacea (Lam.)

Fig. 17 *a*, *b*

Ostrea margaritacea Lamarck, 1819, p. 208.
Ostrea tuberculata (*non* Lam.), Krauss, 1848, p. 30.
Ostrea cochlear (*non* Poli) Odhner, 1923, p. 3 (part: the Cape (G. de Vylder) specimen).
Ostrea procellosa Val., Lamy, 1929.

Ostrea iridescens Gray, Stephenson, Stephenson & du Toit, 1937, p. 378; Stephenson, 1948 p. 267.*
Ostrea prismatica Gray, Haughton, 1929, p. 36, pl. 8, figs. 7–10, pl. 9, figs. 4–7, also pl. 6 (as *imbricata* typ. err.); Stephenson, 1948, p. 267.*
Gryphaea margaritacea (Lam.), Ranson, 1949, p. 251; 1951, p. 3, figs. 1–3, 6 [not figs. 4, 5 = *atherstonei*].
Crassostrea margaritacea (Lam.), Korringa, 1956, pp. 34 et sqq., pl. 14, fig. 1, pl. 18, figs. 1, 2; Macnae & Kalk, 1958, p. 129.

Surface of flat valve with close-set radial riblets. Internally flat valve with or without a series of marginal denticles (granules) near hinge-line fitting into pits in lower valve. Adductor muscle scar distal to the middle of length (altitude) of valve. Shell shape variable, lower valve often with a long umbonal 'beak': e.g. a shell from Still Bay 180 mm. long (alt.) has a beak 95 mm.

Larval shell markedly inequivalve, umbo of the left valve prominent.

Corneous or violaceous, lower valve uniform or with darker pinkish or violaceous radiating stripes.

False Bay to Natal, but rare in Natal. Delagoa Bay (U.W.).

Remarks. Neither Ranson nor Korringa refer to Krauss, who identified the common South African oyster with *tuberculata* Lam. Presumably the Australian *tuberculata*, which name antedates *margaritacea* (1804, p. 358, pl. 67, fig. 2), is to be regarded as a separate species.

The common South African oyster spawns from mid-January to the end of February or early March.

Korringa did not discuss whether the Madagascan shells, referred by Ranson to *margaritacea*, were identical with the South African species.

Ranson saw Odhner's specimens, and identified the specimen from the Cape (G. de Vylder) as *margaritacea*.

Crassostrea cucullata (Born)

Ostrea cucullata Born, 1778, p. 100; 1780, p. 114, pl. 6, figs. 11, 12; Krauss, 1848, p. 30; Roughley, 1926, p. 446; Nardini, 1937, p. 226, pl. 12(6), figs. 4, 5; Stephenson, 1947(48), p. 267; Braga, 1952, p. 96, pl. 7, fig. 5.
Crassostrea cucullata (Born) Macnae & Kalk, 1958, p. 129.

Fossil: Pleistocene, Durban and Umkomaas (Nardini).

East London (rare) northwards to Natal (Stephenson); Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also U.W.); Inhambane (U.C.T.).

Distribution. Madagascar, Indo-Pacific. Also (Nicklès) tropical Atlantic to Angola.

Remarks. Braga's identification of *cucullata* was probably correct, but his records of *vitrefacta* Sow., *pes-tigris* Hanley, *plicata* Chemn., *folium* Linn. require confirmation. The last three (pl. 7, figs. 2, 3 and 4) probably represent merely differently shaped shells of *cucullata*. Franca (1960, pp. 91, 92, pl. 23, figs. 1, 2, pl. 24, fig. 1) recorded *mytiloides* Lam. *plicata* Chemn., and *vitrefacta* Sow., but regarded them as forms of *cucullata*.

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* *Ann. Natal Mus.* xi, part 2, issued March 1948, but reprints dated 1947.

Nardini's specimens from Durban were probably, and those from Umkomaas certainly, from shell-middens.

Gen. Pycnodonta (F. de W.) Sow.

Sexes separate. Eggs small. Oviparous. Promyal cavity present.

Large heavy shells. No strongly marked umbonal cavity. A series of vermiculate grooves perpendicular to the margin on either side of hinge-line in both valves. Inner layers vacuolated (fig. 17 *c*).

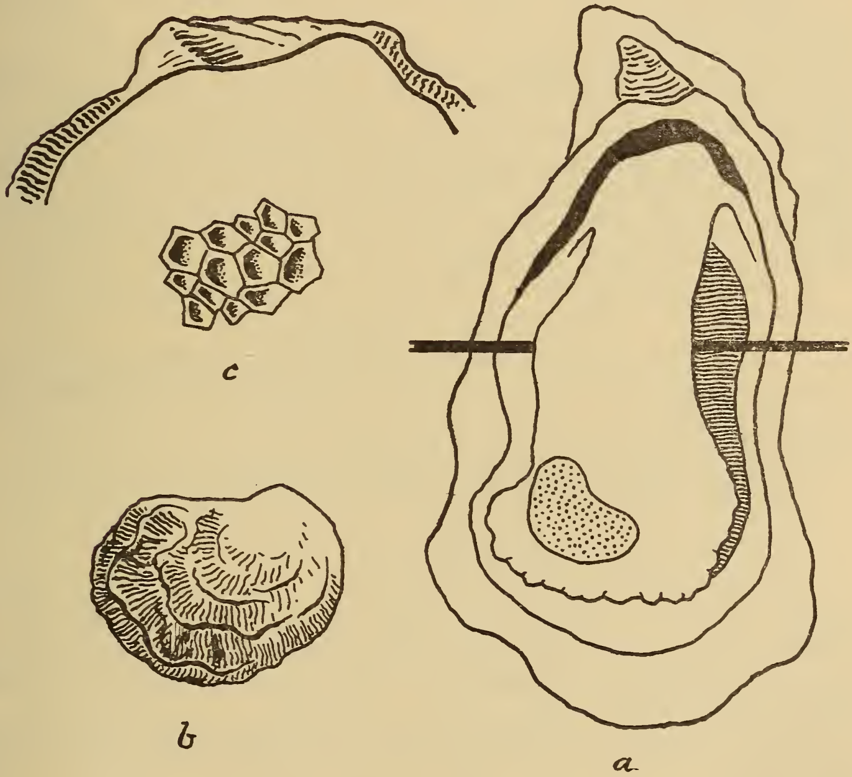

Fig. 17. *Crassostrea margaritacea* (Lam.). *a*, fixed left valve (right valve removed) to show umbonal cavity (black), and animal with black bar passing through the promyal cavity. *b*, right (flat) valve of juvenile, 25 mm., to show close-set radial riblets. *Pycnodonta hyotis* (Linn.). *c*, hinge-line, and portion of vacuolated inner layer of shell.

Prodissoconch with 5 crenulations on the provinculum, and 10 crenulations anterior to the provinculum (Ranson, 1941, p. 61, fig. 1).

Ranson (1949) accepted only 3 species: *hyotis* (Linn.) Atlantic and Indo-Pacific; *cochlear* (Poli) Atlantic only; and *numisma* (Lam.) Indo-Pacific only; but he gave no differential characters.

Associated with coral reefs.

Pycnodonta hyotis (Linn.)

Fig. 17 *c*

Pycnodonta hyotis (Linn.), Ranson, 1941, p. 86, figs. 1–6; 1949, p. 451; Macnae & Kalk, 1958, p. 129.
Ostrea hyotis Linn. Nicklès, 1950, p. 183, fig. 340.

Durban Bay, on floating log (S. Afr. Mus.); Delagoa Bay (U.W.).

Off Cape Vidal (Zululand), 80–100 fathoms, one upper valve, 33 × 27 mm. (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, Mauritius, Indo-Pacific. Atlantic: St. Helena and Lobito Bay (Ranson).

Remarks. Four specimens from the woodwork of a wreck in Steenberg Cove (St. Helena Bay) (S. Afr. Mus.) may be this species. All were attached by the whole lower surface; two have the upper valve more or less radially plicate. One of the others, antero-posterior length 130, dorso-ventral altitude 110 mm., shows on the attached surface the graining of the wood, and this is exactly repeated over the whole surface of the upper valve, which becomes plicate or sharply crenulate only at the margin.

The Cape Vidal specimen is probably referable to this species.

Pycnodonta cochlear (Poli)

Ostrea cochlear Poli, Odhner, 1923, p. 3 (part: the Cape Infanta specimen); ? Nicklès, 1950, p. 183, fig. 341.
Pycnodonta cochlear (Poli), Ranson, 1949, pp. 448, 450.

Off Cape Infanta, 45 fathoms (Odhner, confirmed by Ranson).

34° 24′ S., 18° 41′ E., 106 metres (U.C.T. *teste* Ranson 1949).

Distribution. Atlantic only (Ranson).

Remarks. Ranson's identification of Odhner's specimen from Cape Infanta conflicts with his statement that this species occurs only in the Atlantic.

The figure given by Nicklès shows denticles near the hinge (not vermiculations, as in the figure of *hyotis*), and therefore does not appear to represent a species of *Pycnodonta.*

I have not seen the U.C.T. specimens, which seem to have been retained by Ranson.

Fam. **Astartidae**

Astarte agulhasensis J. & T.

Fig. 18 *a*

Astarte agulhasensis Jaeckel & Thiele, 1931,* p. 212, pl. 8(3), figs. 78, 78*a*.

Lunule distinct in the early stages, bordered by a slight step, which becomes evanescent in later stages. No radial striation or ribbing. All sulci evenly curved; beginning at a very early stage of growth. On a juv. 3 mm. alt. (unworn) 10 oblique sulci and one incomplete at margin; at 5 mm. alt. 15, and at 8.5 mm. *c.* 20, becoming closer together as they approach the margin. Margin internally crenulate.

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* See Introduction, p. 161, and explanations of plates 8–10 (3–5) for division of work and authorship of new species.

Up to length 9·5–10, alt. 8·5 mm. (P.F.).

Some valves show traces of pinkish-red mottling, or radiating streaks; one valve has 2 Λ-shaped reddish marks, one within the other, the apices pointing towards umbo.

35° 26′ S., 20° 56′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres (Jaeckel & Thiele).

Off Cape Natal (Durban), 54 fathoms, one valve; off Sandy Point (north of Kei River mouth), 51 fathoms, 4 valves; off East London, 22–32 fathoms, many valves; off Great Fish Point, 51 fathoms, 3 valves; off Nanquas Peak (east end of Algoa Bay), 49 fathoms, 10 valves; Algoa Bay, several stations, 25–52 fathoms, many valves; off Cape Infanta 40–46 fathoms, 4 juv. living, several valves; off Cape St. Blaize, 125 fathoms, several worn valves (S. Afr. Mus. P.F. coll.).

34° 13′ S., 26° 04′ E., 68 fathoms (U.C.T.).

Astarte (*Digitaria*) *africana* Bartsch

Digitaria africana Bartsch, 1915, p. 194, pl. 45, fig. 4; Turton, 1932, o. 233.
Astarte (*Digitaria*) *africana* Jaeckel & Thiele, 1931, p. 212.

Port Alfred, 2 valves (Bartsch, Turton).

34° 51′ S., 19° 37′ E., 80 metres; 35° 29′ S., 21° 2′ E., 102 metres; 35° 26′ S., 20° 56′ E., 80 metres; valves only (Jaeckel & Thiele).

Astarte (*Digitaria*) *lunulata* n.sp.

Fig. 18 *b*

Closely resembling *africana*, and more inequilateral than *agulhasensis*. Lunule distinct, with 3 radial grooves interrupting the concentric sulci.

Sulci beginning at a later stage than in *agulhasensis*, the first sulcus not completed until the shell is *c.* 1·5 mm. alt. First 2 or 3 (or 4) sulci angular, thereafter gradually becoming evenly curved. At 2 mm. alt. 2 complete and 5–6 incomplete sulci; at 3 mm. about a dozen complete, and on anterior part about 30 total, the sulci becoming closer together as they approach the margin. Margin internally crenulate.

Length 3·5, alt. 3 mm.; also 4 × 3, and 4 × 3·5 mm.

34° 26′ S., 25° 42′ E., 124 fathoms, 3 valves (Types); off Cape Morgan, 47 fathoms, 5 valves (S. Afr. Mus. A9506 (Types), and A9507 P.F. coll.).

Remarks. From the angular shape of the 1st sulcus one would expect these *Pieter Faure* valves to be *africana*, but they are regarded as a different species for the following reasons. Bartsch mentioned and figured radial riblets around the whole shell, but the present valves show no trace of such; on the other hand

Bartsch did not mention a lunule with 3 distinct grooves anteriorly, which are the chief feature of the present valves.

Bartsch had one beach specimen, but considerable abrasion would be required to obliterate the lunule and its grooves, and any riblets on the main surface would be completely lost. Turton found another valve, and maintained the presence of riblets.

Jaeckel & Thiele recorded their examples of *africana* without any comment. Perhaps a re-examination of the *Valdivia* material would show some of the valves to be the present n.sp.

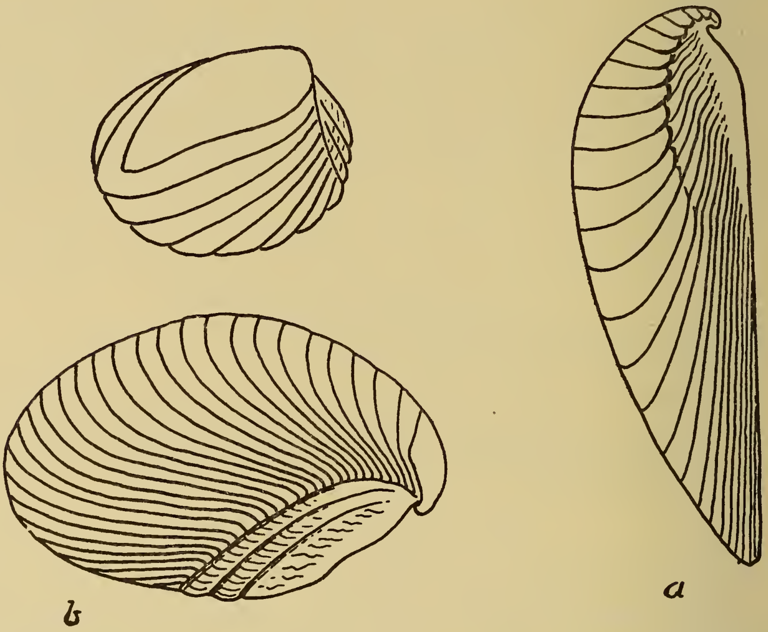

Fig. 18. *a*, *Astarte agulhasensis* J. & T. *b*, *A. lunulata* n.sp., above 2·25 × 2, below 3·5 × 3 mm.

Cuna bartschi nom. nov.

Cuna concentrica (*non* Hedley 1902), Bartsch, 1915, p. 191, pl. 47, fig. 3, pl. 52, figs. 11, 12.
Cuna concentrica Hedley, Jaeckel & Thiele, 1931, p. 215.

Length 2, alt. 2·5 mm. Bartsch gave length *and* altitude 1·2, but the (enlarged) figures measure (external view) 31 × 35 (internal views), 28 × 35 mm.

Port Alfred (Bartsch, Turton).

35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

34° S., 25° 44′ E., 30 fathoms, 6 juv. living, 6 valves (S. Afr. Mus. P.F. coll.).

Remarks. Although Jaeckel said he found no difference between Hedley's

Australian *concentrica* and Bartsch's species of the same name, it seems preferable to have a separate name for the South African shell.

Cuna gemmula W. H. Turton

Cuna gemmula Turton, 1932, p. 231, pl. 60, no. 1613.

This may possibly be a *Cuna*, but is certainly a juvenile, not an adult as Turton thought.

Fam. **Crassatellidae**

The shape of the shell may vary at different stages of growth. Very young shells are subtriangular with a prominent projecting prodissoconch; they then become oval-triangular, and eventually attain the adult shape.

Jaeckel & Thiele (1931, p. 215) record two valves of an unnamed species appearing to differ from any other South African species by having, *inter alia*, the internal margin smooth. This, however, seems to be a juvenile character. E.g. in *tenuis* examples up to about 25 mm. long have a smooth margin, but thereafter crenulations are developed. In *crebrilirata* crenulations are already present at 15 mm. long; and in *natalensis* at 10 mm. long.

Cardita irregularis Turton 1932 is probably a worn *Crassatella*.

Crassatella tenuis Sow.

Crassatella tenuis Sowerby, 1904, p. 10, pl. 6, fig. 17.
Eucrassatella tenuis (Sow.), Jaeckel & Thiele, 1931, p. 214.

Transversely oblong, compressed, thin in juv. but not particularly thin in adult, obtusely angular behind, rounded in front, umbonal ridge very feeble; very fine radial striae, often obscure; concentric lirae thin, sharp, erect, rather distant; at alt. 2·5 mm. 10–11, at 5 mm. 15, at 28 mm. *c.* 28–30, the marginal 4 or 5 close together, subimbricate. Anterior lunule moderately narrow. Margin internally crenulate (except in juv.), adductor scars impressed. Periostracum in larger shells somewhat fibrous at the margin; corneous brown.

Length 40, alt. 27, thickness (valves together) 15 mm.

Cape St. Blaize N. × E. $\frac{1}{4}$ E., distant 65 miles, 85–90 fathoms, one living (Sowerby. P.F. coll.).

34° 51′ S., 19° 37′ E., 80 metres; 35° 29′ S., 21° 2′ E., 102 metres; 35° 16′ S., 22° 26′ E., 155 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

Cape St. Blaize N. × E. $\frac{3}{4}$ E., 73 miles, 105 fathoms, 3 living; Cape St. Blaize N. × E. $\frac{1}{4}$ E., 67 miles, 90–100 fathoms, 3 living; Cape St. Blaize N. × E., 73 miles, 125 fathoms, 18 juv. and half-grown valves 4–28 mm. long; Brown's Bank (approx. 36½° S., 21° E.) 80–100 fathoms, one valve; 34° 26′ S., 25° 42′ E., 124 fathoms, 2 juv. valves (S. Afr. Mus. P.F. coll.).

36° 25′ S., 21° 08′ E., 177 metres (s.s. *Africana* per U.C.T.).

34° 51′ S., 23° 41′ E., 100 fathoms (U.C.T.).

Type in British Museum.

Remarks. This is quite distinctive among the South African species, and therefore Jaeckel & Thiele's identification may be accepted, whatever the specimens from the same localities, identified as *subquadrata*, may prove to be (see under *gilchristi*).

Distinguished by the shape of the concentric lirae, which in profile form a series of inverted Vs, in contrast with those of other species which are inverted Us.

With the exception of the 2 juv. valves from Algoa Bay, and one from Brown's Bank all the P.F. specimens were taken in one rather circumscribed area off Cape St. Blaize; The *Valdivia* obtained it as far west as 19° 37′ E., but whether alive or dead was not stated.

Crassatella ?*tenuis* aberr.

A curious specimen from off Cape St. Francis 75 fathoms, living (S. Afr. Mus. no. 14846. P.F. coll.).

Subtriangular, inflated, rounded in front and behind, postero-dorsal margin convex, antero-dorsal margin straight, ventral margin convex, no umbonal ridge; anterior lunule rather wide and deep, posterior lunule wide; very fine radial striae; sharp concentric lirae from anterior to posterior margin, about 35 from umbo to about 5 mm. from ventral margin, where they become evanescent and succeeded by crowded growth-lines. Adductor scars impressed; margin internally crenulate. Pale, brownish towards the umbones and in the lunules. Length 29, alt. 24, thickness (valves together) 19 mm.

Sowerby identified this specimen as a 'somewhat abnormal' *pallida* Ad. & Rve. 1848; Tomlin later saw the specimen and agreed with this identification. I decline, however, to admit a Chinese species to the South African fauna-list on the strength of a single specimen. I see no reason why it should not be a 'somewhat abnormal' *tenuis*. The sculpture is that of *tenuis*; only the shape is remarkable. In addition to the shortness of the shell, the two valves are not quite equally ventricose.

Crassatella capensis Lamy

Crassatella africana (*non* Marrat), Sowerby, 1904, p. 9, pl. 6, fig. 13.
Crassatella capensis Lamy, 1917, p. 237 (nom. nov.); Tomlin, 1931, p. 446.
Crassatella capensis Odhner, 1923, p. 4, pl. 1, figs. 1, 2 (n.sp.); Tomlin, 1926, p. 300.
Crassatella odhneri Tomlin, 1930, p. 35 (nom. nov. for *capensis* Odhner).

Ovate-oblong, obtusely angled behind, rounded in front, a slight umbonal ridge; very fine radial striae, often obscure; numerous rounded concentric lirae, at least as wide as the grooves, often wider (especially in juv.), becoming obsolete posteriorly in shells of about 10–15 mm. alt., continuing on main part of shell and anteriorly up to alt. *c.* 30 mm., but thereafter evanescent and merging in the rather coarse growth-lines; in juv. at 2·5 mm. alt. 12 lirae, at 5 mm. 22–23, and at 30 mm. *c.* 55, becoming closer together and indistinct near the margin; anterior lunule narrow; margin internally crenulate; adductor muscle scars impressed. Periostracum in larger shells rather rough and fibrous around the margin; yellowish-brown, fulvous, or (large shells) dark brown.

Up to length 45, alt. 30, thickness (valves together) 17 mm. The length/altitude ratio varies slightly, e.g. 43 × 29 and 43 × 32 mm.

Off Cape Infanta, 43 fathoms, one (Sowerby. P.F. coll.).

Off Cape Infanta, 40 fathoms, one valve (Odhner).

Off Mound Point (north of Kei River, Cape Morgan), 34 fathoms, one living, 2 valves; off Cape Morgan, 36 fathoms, one living, and 52 fathoms, one juv. valve; off East London, 27 fathoms, 6 juv. valves; off Nanquas Peak (east end of Algoa Bay), 49 fathoms, 2 juv. valves; Algoa Bay, 67 fathoms, 7 juv. valves; off Gericke Point (Knysna area), 46 fathoms, 2 juv. valves; St. Francis Bay, 24–34 fathoms, 2 juv. valves; off Cape Infanta, 40 fathoms, one living, 2 juv. valves, and 47 fathoms, 2 living; 44 fathoms, one living, one valve, and 46 fathoms, 2 very juv. valves; False Bay 42–47 fathoms, one living and one juv. valve (S. Afr. Mus. P.F. coll.).

Sebastian Bay 30–40 fathoms, one living (S. Afr. Mus. coll. K.H.B.).

False Bay, and 34° 48′ S., 22° 06′ E., 55 fathoms; and 34° 33′ S., 21° 52′ E., 42 fathoms; living (U.C.T.).

Hout Bay (west coast of Cape Peninsula), 9–20 fathoms, 2 living (S. Afr. Mus. P.F. coll.).

Type ? in British Museum.

Remarks. Odhner's *capensis* is obviously the same as Sowerby's *africana*, though the outline of the latter as figured may give a false impression. The present material, however, shows that the shape and the length/altitude ratio may vary.

Juveniles are sometimes difficult to separate from juveniles of *gilchristi*, though the concentric lirae are usually clearly more numerous in *capensis*.

Living examples have been taken in the Cape Morgan area, the Cape Infanta area, and at the mouth of False Bay; the species seems to be more abundant in the Cape Infanta area than elsewhere.

Two living examples were obtained at Hout Bay on the west coast of the Cape Peninsula, according to the *Pieter Faure* number 2276. This locality is rather surprising. An error in transcribing the number may have occurred; the original P.F. label is not extant. No other 4-figure number beginning with 2 offers a better locality; there are no 5-figure numbers beginning with 2; P.F. 1276 would give Cape St. Blaize, 34 fathoms, which would be acceptable. However, the occurrence of *Crassatella* on the west coast is supported by the recent capture of a living *gilchristi* at nearly the same locality by U.C.T.

Crassatella sowerbyi Lamy

Crassatella acuminata (*non* Kobelt), Sowerby, 1889b, p. 156, pl. 3, fig. 6; 1892, p. 62, pl. 2, fig. 69.
Crassatella sowerbyi Lamy, 1917, p. 236; Turton, 1932, p. 230.
Crassatella sowerbyi var. *rubrolineata* Turton, 1932, p. 231, pl. 60, no. 1611 (3 figs.).
Crassatellites sowerbyi (Lamy), Tomlin, 1931, p. 447.

Concentric lirae low, rounded-flattened, about as wide as the grooves, when not worn both lirae and grooves with very fine radial striae. Uniform yellowish-brown, or with faint radial stripes, or with longitudinal (antero-posterior) wavy or zigzag reddish bars, continuous or disrupted.

Length 35, altitude 22 mm. (Sowerby).

Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton; also S. Afr. Mus.).

Off Cove Rock (East London), 22 fathoms, 5 worn valves; 33° 50′ S., 25° 54′ E., 30 fathoms, one worn valve (S. Afr. Mus. P.F. coll.).

Remarks. Two of the Cove Rock specimens retain some of the periostracum, but only one is fresh enough to show the radial striation.

Turton's lower right-hand figure agrees well with Sowerby's figure; but his other two figures of smaller shells show a slightly angulated postero-dorsal margin.

Of the present material (only 7 valves!), 2 of the Cove Rock valves can be described as acuminate, but the other 3 have a convex (though slightly angular) postero-dorsal margin, almost as in *gilchristi.* The smaller Algoa Bay specimen and a very worn valve from the Kowie (Port Alfred) are also slightly angulated, producing a slightly truncate posterior margin. Is the acuminate shape due to abrasion?

This species has never been taken alive. The concentric liration is very like that on *gilchristi.*

Crassatella gilchristi Sow.

Crassatella gilchristi Sowerby, 1904, p. 8, pl. 6, fig. 14; Lamy, 1917, p. 238.

Transversely oblong, obtusely angled behind, rounded in front, postero-dorsal corner rounded, ventral margin rather straight or slightly convex, sometimes slightly concave; umbonal ridge obscure; very fine radial striae and concentric growth-lines; concentric lirae broad, about equal in width to the grooves, rounded-flattened (not due to abrasion), obsolescent anteriorly and posteriorly, in juv. at 2·5 mm. alt. 9 lirae, at 5 mm. 15–16, at 21–26 mm. *c.* 30. Anterior lunule long, narrow; margin internally crenulate; adductor scars impressed. Brown.

Length 29, alt. 21·5, thickness (valves together) 14 mm. (Sowerby); single valves (S. Afr. Mus.) 27 × 19, 29 × 21·5, 34 × 22·5 mm.; U.C.T. 37 × 26 × 14 mm.

Martha Point, Struys Bay (between Cape Agulhas and Cape Infanta), 42 fathoms, one (Sowerby. P.F. coll.).

Martha Point, 42 fathoms, 10 valves, Topotypes; off Cape St. Blaize, 39 fathoms, 2 half-grown valves; 34° 5′ S., 25° 43′ E., 52 fathoms, 5 juv. and 2 ad. valves (S. Afr. Mus. P.F. coll.).

34° 09′ S., 18° 16′ E. (off Hout Bay, west coast of Cape Peninsula), 41 fathoms, one living (U.C.T.).

Type ? in British Museum.

Remarks. Tomlin informed me that he considered this a synonym of *subquadrata* Sow. 1870; but he also said that *tenuis* was a young *subquadrata.* This cannot be correct, because *tenuis* and *gilchristi* are quite distinct. Sowerby (1904) said *tenuis* resembled *subquadrata.* Lamy also noted the resemblance between *subquadrata* and *tenuis,* and regarded *gilchristi* as a distinct species.

Jaeckel & Thiele (1931) recorded both *subquadrata* and *tenuis,* stating that the latter was very near the former but distinguished by the thin shell, fine radial sculpture, and prominent anterior end. All the *Valdivia* localities are on the Agulhas Bank and fall within the area of distribution as shown by the P.F. material; for distributional purposes therefore they may be disregarded, while the identity of the shells remains *sub judice.*

The shape of the largest shell in South African Museum, 34 × 22·5 mm., is notably more elongate than usual.

The 10 topotype valves are from the bottom-sample of the same haul which obtained the single specimen described by Sowerby.

Only 9 others are referable to *gilchristi*: 2 from Algoa Bay measure 22 and 25 mm. in length, the latter with rather strongly convex ventral margin, but otherwise typical; the 5 juv. measure 3–8 mm. in length. The 2 from Cape St. Blaize are half-grown, length 15 mm. and 17 mm., and like the juveniles flatter than the larger shells; faint brown radiating streaks are visible.

Crassatella crebrilirata Sow.

Crassatella crebrilirata Sowerby, 1870, p. 249; Lamy, 1917, pp. 237, 238.
Crassatella angulata Sowerby, 1904, p. 9, pl. 6, fig. 16.

Transversely oblong, angularly truncate behind, rounded in front, umbonal ridge (Sowerby, 1904: 'angle') well marked but rounded; very fine concentric growth-lines, becoming coarser and subliriform after shell has reached an altitude of *c.* 12 mm.; obscure radial striae seen after removal of periostracum. Anterior lunule rather long; margin internally crenulate; adductor scars raised, the posterior one more so than the anterior one. Corneous, fulvous, or pinkish, sometimes with faint pale radiating streaks.

Length 28, alt. 18, thickness 13 mm. (Sowerby: *angulata*; also S. Afr. Mus.).

Agulhas Bank, 15 fathoms (Sowerby: *crebrilirata*).

Off Umhlangakulu River (Natal), 50 fathoms, one (Sowerby: *angulata.* P.F. coll.).

Off Sandy Point (north of Kei River), 51 fathoms, one ad. and 2 half-grown living, and 5 valves; off Cape Morgan, 45–52 fathoms, 4 worn valves; Nanquas Peak (east end of Algoa Bay), 49 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Type of *angulata* ? in British Museum.

Remarks. Tomlin informed me he agreed with Lamy that *angulata* was synonymous with *crebrilirata.*

The Type of *angulata* was originally entered in the South African Museum register (no. 14847), but is no longer present in the collection.

The non-lirate early part of the shell distinguishes this species from *capensis*, as do also the raised adductor scars, particularly the posterior one.

The Nanquas Peak specimen is covered from anterior to posterior margin with close-set concentric orange-brown zigzags.

Crassatella abrupta Sow.

Crassatella abrupta Sowerby, 1904, p. 10, pl. 6, fig. 15.

Subtriangular, with strong rounded smooth concentric lirae, as broad as, or slightly narrower than the grooves, *c.* 19 at alt. 5–6 mm., 22–23 at 9 mm., obsolescent posteriorly on older shells; extremely fine radial striae seen in the grooves and on the later formed lirae but worn off near the umbones.

Length 16, alt. 14, thickness (valves together) 10 mm. (Sowerby).

Off Umhloti River (Natal), 100 fathoms (Sowerby. P.F. coll.).

O'Neil Peak (Zululand), 90 fathoms, 6 living, 4 valves, and one very juv. valve; off Cape Natal (Durban), 85 fathoms, 3 valves (S. Afr. Mus. P.F. coll.).

29° 46′ S., 31° 17′ E., 60–70 fathoms (U.C.T.).

Type in British Museum.

Remarks. C. indica Smith 1895 (1897, pl. 4, figs. 3, 3*a*, *b*) is comparable, but the abrupt posterior endings of the lirae, not clearly shown in Sowerby's figure distinguishes the South African species. According to Smith (1906a, p. 258) *Crassatellistes* [*sic*] *omanensis* from the Gulf of Oman, 230 fathoms, is even closer to *abrupta*, but grows to a larger size and is more compressed: 35 × 28 × 17 mm.; and has continuous lirae.

Crassatella burnupi Lamy

Fig. 19 *a*

Crassatella burnupi Lamy, 1920b, p. 153, text-fig.

Worn valve—subtriangular (Lamy: subquadrangular), obliquely truncate behind, broadly rounded in front, umbonal ridge distinct; concentric lirae broad, flat; radial striae visible in umbonal region. Length 50, alt. 41, thickness (one valve) 15 mm. (Lamy).

Umkomaas, Natal (Lamy. coll. Burnup *circa* 1900).

Type in Paris Museum.

Remarks. No further specimens of this curious form seem to have been recorded; which is perhaps not surprising because wave action and weathering do not always produce the same shape from shells originally alike. Lamy did not suggest to what extent the posterior margin was due to wear. How thick is the margin? Such a specimen should not have been described as a new species. It is scarcely eligible for inclusion in the fauna-list.

A free-hand copy of Lamy's photographic text-figure is here given for comparison with the next species.

Crassatella natalensis n.sp.

Fig. 19 *b*

Subquadrangular, moderately convex, obliquely truncate behind, rounded in front, umbonal ridge distinct, postero-dorsal margin straight, posterior margin straight, sometimes very slightly concave, ventral margin not very convex; faint traces here and there of very fine radial striae on some valves (sed ?); concentric lirae *c.* 10 at 2 mm. alt., 18–20 at 5 mm., 29–35 at 14 mm., rounded, about as wide as the grooves but sometimes narrower, up to alt. 2 mm. evenly rounded from anterior to posterior margin, thereafter rather sharply bent at right angles at the umbonal ridge. Adductor muscle scars impressed, margin internally crenulate. The freshest valves with faint traces of orange radial, somewhat discontinuous stripes.

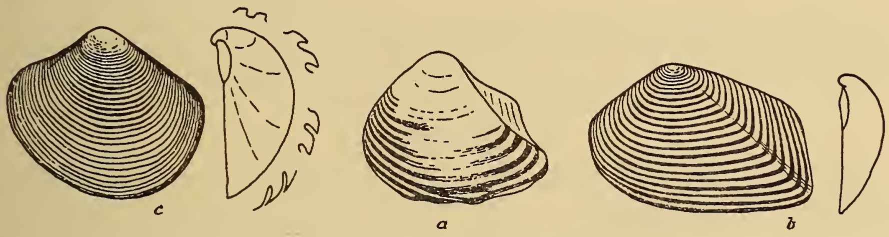

FIG. 19. *a*, *Crassatella burnupi* Lamy. copy after Lamy. *b*, *C. natalensis* n.sp., with profile, *c*, *C. pilual* n.sp., with profile, and profiles of lirae at different stages.

Length 20, alt. 14, thickness (one valve) 4–5 mm.

Off O'Neil Peak (Zululand), 90 fathoms, 11 valves; off Umhloti River (Natal), 40 fathoms, one valve; off Cape Natal (Durban), 54 fathoms, 4 valves and one juv. (Types) (S. Afr. Mus. Nos. A9509 (Types), A9510, A9511. P.F. coll.).

Remarks. If these smaller valves should prove to be *burnupi*, the 'cause accidentale' (Lamy) of only one worn valve of *burnupi* having been washed ashore might perhaps be the deep water habitat at which the present valves were dredged.

The feature distinguishing these valves from other South African species is the right-angled bend of the lirae at the umbonal ridge (more marked than in *tenuis*). This appears also in *burnupi*, but in the latter the shape of the area encompassed by the umbonal ridge, the anterior and the ventral margin approximates far more to an equilateral triangle than in the present valves.

The course of the lirae is somewhat similar in *tenuis*, but in *natalensis* the lirae are not Λ-shaped, and the umbonal ridge is more distinct.

Crassatella pilula n.sp.

Fig. 19 *c*

Strongly convex, short quadrangular, rounded-subtruncate behind, rounded in front, postero-dorsal margin straight, antero-dorsal margin straight or very slightly concave, sloping, approximately at right angles to the postero-dorsal margin, posterior margin nearly straight, ventral margin convex; fine radial striae, best seen posteriorly where the grooves are not so narrow as elsewhere; numerous concentric lirae from anterior to posterior margins, flattened, about as wide as grooves in early stages, but later wider than the grooves, the latter often and especially near the ventral margin becoming mere impressed lines due to the distal margin of the lirae projecting over the grooves like eaves on a house; at 2 mm. alt. *c.* 15 lirae, at 5 mm. 26, at 11 mm. *c.* 53. No umbonal ridge; anterior lunule broad (length 4, width 2·5 mm.). Adductor muscle scars impressed, margin internally crenulate. Yellowish-buff, one valve with faint traces of orange radial streaks.

Length 13, alt. 11·5, thickness (valves together) 9·75 mm.

Off Cape Morgan, 77 fathoms, 3 living, 7 valves (S. Afr. Mus. No. A3665. P.F. coll.).

Remarks. Shorter and more inflated than any of the other South African species. More obese than *indica* Smith 1895, but otherwise very similar. The subimbricate lirae on the later part of the shell are rather distinctive.

Fam. **Carditidae**

Turton's *Cardita rufanensis* is *Arca* (*Barbatia*) *cafria*; and *C. irregularis* is probably a worn *Crassatella.*

Cardita variegata Brug.

Cardita variegata Bruguière, 1792, p. 402; 1797, pl. 223, fig. 6; Krauss, 1848, p. 13; Jaeckel & Thiele, 1931, p. 215; Prashad, 1932, p. 143 (references); Nardini 1937, p. 250, pl. 16(10), fig. 15; Stephenson, 1948, p. 267; Macnae & Kalk, 1958, pp. 37, 129.

Cardita variegata var. *turgida* Krauss, 1848, p. 13.

The smallest present shell 12 mm. in length shows no trace of the formation of a brood chamber. In some of the shells the ventral margin may be slightly concave, but there is no notch or indent as in *T. concamerata.*

Fossil: Post Pliocene; Inhambane (Cox 1939); Pleistocene, Geol. Surv. S. Afr. Durban, Zanzibar (Cox).

Natal (Krauss; also S. Afr. Mus.).

Umpangazi (Zululand) to Port St. Johns (Stephenson, U.C.T.).

Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also U.W.); Bazarute Island (S. Afr. Mus.).

35° 16′ S., 22° 26′ E., 155 metres, one valve (Jaeckel & Thiele).

Off O'Neil Peak (Zululand), 90 fathoms, one worn valve (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, East Africa, Madagascar, Indo-Pacific.

Cardita pulcherrima Sow.

Cardita pulcherrima Sowerby, 1904, p. 7, pl. 6, fig. 2.

Subcircular, with 19 radial riblets, ornamented with close-set, longitudinally oval bead-like nodules. Buff, obscurely variegated with orange-brown.

Length 10, alt. 10, thickness (valves together) 6·5–7 mm. One of the worn valves from Cape Natal, 85 fathoms 11 × 11 mm.

Off Cape Natal (Durban), 54 fathoms (Sowerby, P.F. coll.).

Same locality, 4 living, 6 valves, cotypes; same locality, 85 fathoms, 2 valves; off Umhloti River, 40 fathoms, 6 valves (one of them juv.); off Umkomaas, 40 fathoms, one living, 16 valves (from 3 mm. upwards); off Tugela River, 65–80 fathoms, 3 valves; off O'Neil Peak (Zululand), 90 fathoms, 4 valves; off Hood Point (East London), 49 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Type ? in British Museum. Cotypes in South African Museum (No. A9512).

Remarks. Has the same beaded (like little sausages) riblets as *Carditella rugosa*, but differs in shape.

The figure of *pelseneeri* Prashad (1932, p. 147, pl. 5, figs. 1, 2), from the East Indies, appears very similar.

Thecalia concamerata (Brug.)

Fig. 20 *a*

Cardita concamerata Brug. Krauss, 1848, p. 13; Jaeckel & Thiele, 1931, p. 216; Turton, 1932, p. 232.
Thecalia concamerata (Brug.), Stephenson, 1948, p. 267.
Cardita rietensis Turton, 1932, p. 232, pl. 60, no. 1616 (= juv.).

Radial riblets on the part anterior to the ventral notch (which indicates the brood chamber) 7–8 (9), posterior to the notch (6)7–12; usually squamose, sometimes strongly so, but variable.

The brood chamber begins to develop at about 8–10 mm. length. Externally it is marked by an indent or notch. In large examples the shell posterior to this notch is much deeper than the anterior part.

The smallest shell containing juveniles in the brood chamber is 11 mm. in length; but at this length the chamber is not always fully developed. A fully developed chamber may occupy about one quarter of the area of the valve, e.g. in a shell length 15, alt. (deepest part) 11 mm. the chamber measures 6·5 × 5 mm.

Juveniles with prodissoconch from 0·25 up to 0·5 mm. are found in the brood chamber; they seem to be liberated at a length of 0·5–0·75 mm., at which stage they are oval in shape and equilateral. At about 1 mm. length the radial riblets *c.* 11–12 begin to appear; the junction between the prodissoconch and later growth persists as a raised collar, which can be seen in (unworn) shells up to about 8 mm. length. At 2 mm. length the shell is definitely inequilateral.

Length up to 21 mm.

Saldanha Bay, Table Bay, False Bay to Mossel Bay (S. Afr. Mus.); Port Alfred (Bartsch, Turton); Natal (Krauss).

Port Nolloth to Table Bay, and False Bay to Kleinmond (Bathurst Division) (U.C.T.).

34° 51′ S., 19° 37′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres, valves (Jaeckel & Thiele).

Algoa Bay, 67 fathoms; off Cape Morgan, 47 fathoms; and Cove Rock (East London), 43 fathoms, all dead valves (S. Afr. Mus. P.F. coll.).

Off Table Bay, 131–136 fathoms, living (S. Afr. Mus. P.F. coll.).

Remarks. Stephenson (U.C.T.) obtained no material, identifiable with certainty as *concamerata*, east of Kleinmond. The species occurs as far as Port Alfred; but Krauss is the only author to record it from Natal.

Turton refers to the suggestion (cf. Smith 1885, p. 215) that shells without brood chambers are male. Among dozens of this common shell I have not seen one over 10 mm. in length without indication of the formation of a brood chamber; but I have no suitably preserved material to determine whether the species is di- or monoecious.

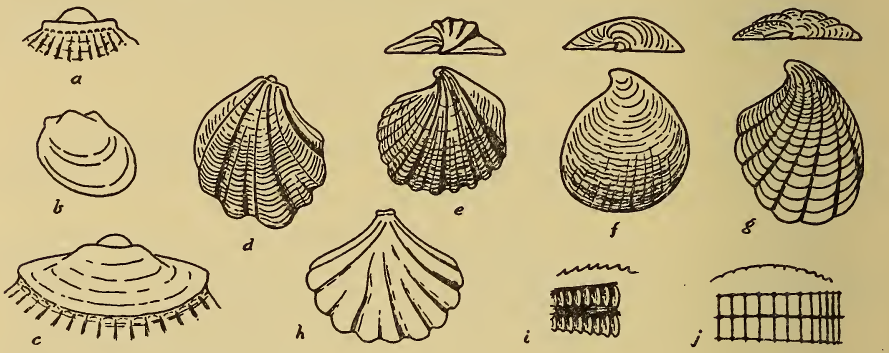

FIG. 20. *a*, *Thecalia concamerata* (Brug.) prodissoconch. *b*, *c*, *Carditella rugosa* Sow., juvenile with prodissoconch, 0·75 mm.; prodissoconch and umbo of shell 1·3 mm. long (antero-posterior). *d*, *e*, *Venericardia elata* (Sow.) right valve of juvenile 1·25 × 1·5 mm., left valve of adult, with profile. *f*, *V. minima* (Smith) left valve. *g*, *V. fortisculpta* n.sp. left valve, with profile. *h*, *C. laticosta* Smith juvenile 1·5 × 1·3 mm. *i*, *C. capensis* Smith two radial ribs with profile. *j*, *C. similis* J. & T. two radial ribs with profile.

Venericardia elata (Sow.)

Fig. 20 *d*, *e*

Cardita elata Sowerby, 1892, p. 63, pl. 3, fig. 67; Turton, 1932, p. 232.
Venericardia elata (Sow.), Bartsch, 1915, p. 192; Jaeckel & Thiele, 1931, p. 216.
Venericardia africana Bartsch, 1915, p. 192, pl. 48, fig. 3, pl. 54, figs. 5, 6.
Cardita africana (Bartsch), Turton, 1932, p. 232.

Prodissoconch separated from succeeding growth by a slight collar, 0·3 mm. wide (antero-posteriorly), 3 riblets beginning at collar but soon, at alt. 0·5 mm., with an additional one, making the 4 main ribs which demarcate the middle area of the shell, and from which the anterior and posterior areas slope away; posteriorly this slope is slightly but usually distinctly concave; additional riblets develop by interpolation between the 4 main ribs, also on the anterior area, up to a total of 16–17. Close-set concentric growth-lines crossing the ribs and grooves, undulate, often somewhat lamellose and imbricate. Margin internally crenulate.

Up to length 6, alt. 6·5 mm.; but usual size 4·5 × 5 mm.

Port Elizabeth (Sowerby). Port Alfred (Smith, Bartsch, Turton).

34° 8′ S., 24° 59′ E., 80 metres; 35° 29′ S., 21° 3′ E., 102 metres (Jaeckel & Thiele).

Off Cape Natal (Durban), 85 fathoms, 20 valves; off Illovo, 27–30 fathoms, one living, 7 valves; off Cape Morgan, 45–52 fathoms, 3 living, 23 valves; Sandy Point (north of Kei River), 51 fathoms, 2 living, 7 valves; off Cove Rock (East London), 22 fathoms, 16 valves; Algoa Bay, 33 fathoms, one living, 10 valves; St. Francis Bay, 24–34 fathoms, one valve (S. Afr. Mus. P.F. coll.).

False Bay, 22 fathoms (U.C.T.).

Remarks. The present material, living, fresh and in various stages of wear, juvenile and adult, leaves no doubt as to the above synonymy. Neither Bartsch nor Turton seem to have realized that *elata* has more ribs than *africana* merely because the former is a larger and older shell.

The raised median area with its four main ribs is characteristic; though some specimens may not be too easily distinguished from *minima.*

In some valves decomposition of the surface produces a series of pits along one or more of the growth-lines in the grooves between the ribs.

Venericardia minima (Smith)

Fig. 20*f*

Cardita minima Smith, 1904a, p. 41, pl. 3, fig. 22; Turton, 1932, p. 232.
Cardita minima var. *uniradiata* Turton, 1932, p. 232, pl. 60, no. 1621.
Cardita formosa Turton, 1932, p. 232, pl. 60, no. 1622.
Miodontiscus minima (Smith), Bartsch, 1915, p. 193.
Venericardia (*Miodontiscus*) *agulhasensis* Jaeckel & Thiele, 1931, p. 216, pl. 8(3), figs. 82, 82*a*.

Profile from anterior to posterior margins evenly curved. Juveniles (*minima*) with only close-set concentric growth-lines; radial ribs (*agulhasensis*) beginning at about 2–2·5 mm. alt., but sometimes earlier 1·5–2 mm., always subordinate to the growth-lines which in adult become undulate, sublamellose and imbricate.

Length 5·5, alt. 6·5 mm.

Port Alfred (Smith, Bartsch, Turton). Still Bay, juv. only (S. Afr. Mus. coll. Muir).

34° 51′ S., 19° 37′ E., 80 metres; 35° 29′ S., 21° 3′ E., 102 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

Algoa Bay 33 and 67 fathoms, 4 juv. living, and numerous juv. and ad. valves. Off Cape St. Blaize, 37 fathoms, one juv. (S. Afr. Mus. P.F. coll.).

33° 58′ S., 25° 42′ E., 14 fathoms (U.C.T.).

Remarks. The numerous specimens from Algoa Bay show the change from *minima* to *agulhasensis.*

Venericardia fortisculpta n.sp.

Fig. 20 *g*

Profile from anterior to posterior margins evenly curved. Seven narrow and shallow radial grooves separating 8 low, broad, rounded ribs. Growth-lines well separated. Margin internally undulate, corresponding with the external ribbing.

Length 3·3, alt. 3·5 mm.

Port Alfred, one worn valve (S. Afr. Mus. coll. et don. W. H. Turton, labelled *africana*).

Algoa Bay, 52 fathoms, 4 valves (S. Afr. Mus. A9519 Types. P.F. coll.).

Venericardia nuculoides n.sp.

Subtriangular, a little longer than high, slightly oblique, the gently convex postero-dorsal margin a little longer than the straight (or very slightly concave) antero-dorsal margin, umbones curving forwards but not hook-like as in *elata*. Prodissoconch distinct, smooth and polished, but no definite collar; 20–24 low, flat radiating riblets, never conspicuous, often indistinct. Fine close-set growth-lines, smooth. Margin internally crenulate, corresponding with the external ribbing.

Length 5·5, alt. 5 mm.

Periostracum pale brown or corneous, the umbonal region usually more or less corroded.

Sea Point (Cape Town) (S. Afr. Mus. Nos. 5001, 5002, A7447).

Living: 32° 5′ S., 18° 17′ E., 15 fathoms (Types); 32° 5′ S., 18° 16′ E., 20 fathoms (U.C.T.).

Types in South African Museum (S. Afr. Mus. Reg. no. A29661).

Remarks. The slight obliquity and the colour give this species a Nucula-like appearance. The obliquity distinguishes it from *Carditella subradiata,* the latter moreover having stronger radial sculpture.

Incubatory.

A small living specimen from Still Bay (S. Afr. Mus. A9508 coll. Muir) is probably this species; but as the species has not been found in False Bay, further material is required to confirm its occurrence on the south coast.

Fam. **Condylocardiidae**

Carditella rugosa Sow.

Fig. 20 *b*, *c*

Carditella rugosa Sowerby, 1892, p. 63, pl. 3, fig. 65; Jaeckel & Thiele, 1931, p. 213; Turton, 1932, p. 233, pl. 61, no. 1625 (3 figs.).

Adult inequilateral. Prodissoconch 0·5 mm. long (antero-posteriorly), with collar, succeded by a smooth space and a second collar; at this stage length 1 mm., after which the riblets (14)15 appear; these ribs run to the margin without any additional ribs being interpolated, except one or two at the anterior or posterior margin, making a total of 16–17. Up to 3·5 mm. length the shell remains equilateral. Growth-lines close. Ribs with oblong-oval beads.

Up to length 10, alt. 8 mm.

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Still Bay (S. Afr. Mus. coll. Muir).

34° 51′ S., 19° 37′ E., 80 metres; 34° 8′ S., 24° 59′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres; 35° 29′ S., 21° 3′ E., 102 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

Off Cape Morgan, 52 fathoms, one living, several valves; off East London, 22–49 fathoms, 2 living, numerous valves; Algoa Bay, 25–67 fathoms, numerous valves; off Cape St. Blaize, 39 fathoms, 6 valves (S. Afr. Mus. P.F. coll.).

Remarks. Growth-lines on the smooth area within the 2nd collar seem to be accentuated by wear, usually two as shown in Turton's lower right-hand figure. Very young shells up to 2 mm. might be difficult to distinguish from those of *Thecalia concamerata* except for the double collar. After 2 mm. *T. concamerata* is inequilateral, and becomes far more inequilateral than *rugosa.*

A specimen at the 2nd collar stage, sent to the South African Museum by Turton, was misidentified by him as *Condylocardia io* Bartsch.

Carditella laticosta Smith

Fig. 20 *h*

Carditella laticosta Smith, 1904a, p. 41, pl. 3, fig. 23; Jaeckel & Thiele, 1931, p. 212.
Cardita laticostata [sic] Bartsch, 1915, p. 192; Turton, 1932, p. 231, pl. 60, no. 1614 (adult & juv.).

Oval, inequilateral, compressed; 12–13 radial ribs, not squamose or beaded; very fine close-set concentric growth-lines crossing ribs and grooves. Prodissoconch with inconspicuous collar; at 1·5 × 1·3 mm. equilateral, with 5 riblets, including the thickened antero- and postero-dorsal margins, increasing by bifurcation.

Length 7·5, alt. 4·5 mm.

Port Alfred (Smith, Bartsch, Turton).

34° 51′ S., 19° 37′ E., 80 metres, one valve (Jaeckel & Thiele).

Algoa Bay, 67 fathoms, 7 valves, including one very juv.; off Cape Morgan, 52 fathoms, 8 valves; off Cape Infanta, 46 fathoms, one valve; off Cape St. Blaize, 37 fathoms, one worn valve (S. Afr. Mus. P.F. coll.).

Carditella valdiviae J. & T.

Carditella valdiviae Jaeckel & Thiele, 1931, p. 212, pl. 8(3), fig. 79.

Oval, inequilateral, somewhat similar in shape to *laticosta*, but with *c.* 20 radial riblets, crossed by irregular concentric growth-lines. Length 6·5, alt. 5 mm., and 7·5 × 6 mm.

34° 51′ S., 19° 37′ E., 80 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

Off Cape Infanta, 46 fathoms, one valve; Hood Point (East London), 49 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. Jaeckel & Thiele had several valves, some of them damaged; and probably they were all more or less worn. The only P.F. specimen which resembles the figure is worn, but appears to have had nodulose ribs.

Carditella capensis Smith

Fig. 20 *i*

Carditella capensis Smith, 1885, p. 216, pl. 15, figs. 7–7*c*; Jaeckel & Thiele, 1931, p. 213.

Equilateral. Prodissoconch with a collar, succeeded by a smooth area, usually showing one or two accentuated growth-lines, bounded by a 2nd collar as in *rugosa*, length (antero-posteriorly) 0·5 mm. Ribs 17–18(19), no interpolated ribs except one or two at antero- and postero-dorsal margins, with raised *squamulae* (Smith: 'compressed nodules') where crossed by the concentric growth-lines; intervening grooves well marked, only slightly narrower than the ribs. Length 5·3, alt. 4·75.; Smith: 4 × 3·5 mm.

Simon's Bay, False Bay, 15–20 fathoms (Smith).

33° 50′ S., 25° 48′ E.; 35° 29′ S., 21° 3′ E., 102 metres (Jaeckel & Thiele).

False Bay, including the type locality, 14–45 fathoms, living and valves; off Cape St. Blaize, 60 fathoms, 7 valves; off Cape Infanta, 46 fathoms, one living, 3 valves; off Sandy Point (north of Kei River), 51 fathoms, one living, one valve; off Saldanha Bay, 37 fathoms, 2 living (S. Afr. Mus. P.F. coll.).

34° 17′ S., 17° 53′ E., 320 metres, one juv. living (U.C.T.). False Bay, 7 fathoms, Algoa Bay, 42 fathoms (U.C.T.). Lüderitzbucht, 73 metres (U.C.T.).

Distribution. Great Fish Bay, Angola (Jaeckel & Thiele).

Remarks. Incubatory. The profile of the ribs is serrate.

The Saldanha Bay specimens are somewhat corroded, but show the characteristic features (see *similis*).

Carditella similis J. & T.

Fig. 20 *j*

Carditella similis Jaeckel & Thiele, 1931, p. 214, pl. 8(3), fig. 81.

Equilateral. Prodissoconch with collar, and smooth area bounded by a 2nd collar, as in *rugosa* and *capensis*. Ribs 20–21, with *flat* nodules, oval-subcircular in early growth, becoming transversely quadrangular later, and then near the margin in adult shells narrow transverse bars; intervening grooves very narrow, sometimes like mere knife cuts. Length 8·5, alt. 7·25 mm.

33° 50′ S., 25° 48′ E.; 35° 16′ S., 22° 26′ E., 155 metres; 33° 41′ S., 18° 0′ E., 178 metres (off Table Bay) (Jaeckel & Thiele).

Algoa Bay, 52 fathoms, several living and valves; off Cape St. Blaize, 125 fathoms, several living and valves; Cape Point N.E. ½ N. (off west coast of Cape Peninsula) 145 fathoms, one living; Lion's Head (Table Mt.) S.E., 95 fathoms, 2 living; off Paternoster Point (Saldanha Bay), 31 and 80 fathoms, several living, corroded (S. Afr. Mus. P.F. coll.).

Off Saldanha Bay, 150 fathoms (U.C.T.). 34° 51′ S., 23° 41′ E., 100 fathoms (U.C.T.).

Remarks. Distinguished from *capensis* by the very narrow grooves, and the flat nodules on the ribs; the profile of the ribs is not serrate, except somewhat bluntly near the margin in adult shells. Incubatory.

A very similar sculpture is seen in *Cuna gambiensis* Nicklès (1955, p. 147, fig. 20 A).

The specimen from off the west coast of the Cape Peninsula is not corroded; the larger of the two from off Table Bay is slightly corroded at the umbones. But the Saldanha Bay specimens are all more or less badly corroded, including living shells, a condition which is found in several other shells from this area.

Carditella subradiata J. & T.

Carditella subradiata Jaeckel & Thiele, 1931, p. 213, pl. 8(3), fig. 80.

Equilateral. A smooth area succeding the prodissoconch with growth-lines only, but not so distinct as in the other species, and without a collar separating it from the ribs. Ribs 22–24, smooth, crossed only by very fine and close-set concentric growth-lines; grooves shallow, narrower than the ribs. Length 3·8, alt. 3·5 mm. Jaeckel & Thiele record some specimens exceeding these measurements by 1 mm.

35° 26′ S., 20° 56′ E., 80 metres; 35° 29′ S., 21° 3′ E., 102 metres (Jaeckel & Thiele).

Off Tugela River (Natal) 65–80 fathoms, one valve; off Umhloti River (Natal), 40 fathoms, 23 living, 12 valves; off Cape Natal (Durban), 54 fathoms, 3 living, 2 valves; off Umkomaas (Natal), 40 fathoms, 5 living, 27 valves; off Hood Point (East London), 49 fathoms, one double-valved but dead; Algoa Bay, 67 fathoms, 18 valves; off Cape St. Blaize, 37 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Algoa Bay, 14 fathoms (U.C.T.).

Remarks. Seems to be a Natal species, as all the P.F. valves from farther south are worn.

Fam. **Corbiculidae**

Corbicula africana (Krauss)

Corbicula africana (Krauss), Connolly, 1939, p. 619, pl. 18, figs. 10–14.

This fluviatile species is mentioned only to record a single valve taken by the *Pieter Faure* off Nanquas Peak (eastern end of Algoa Bay) N.W. ¼ N. distant 15 miles, 49 fathoms.

Fam. **Kellyellidae** (Vesicomyidae)

Vesicomya valdiviae J. & T.

Vesicomya valdiviae Jaeckel & Thiele, 1931, p. 229, pl. 9(4), fig. 101.

Shell large, 60 × 37 mm., oval, thick, chalky, with concentric growth-lines. In each valve 3 stout cardinal teeth, and an anterior lateral tooth.

Specimens of this species are recorded as having been obtained in the North Atlantic (24° 35′ N., 17° 4′ E., 2,500 metres), and also on the Agulhas Bank: 35° 10′ S., 23° 2′ E., 500 metres.

The genus occurs in deep water in the Atlantic and Indian Oceans, and its occurrence on the south-eastern slope of the Agulhas Bank is not very surprising.

This area was not explored by the *Pieter Faure*, whose main objective was the fishing areas on the Agulhas Bank itself. Browne's Bank on the southern tip of the Bank was dredged, but no specimens of, or fragments referable to *Vesicomya* were obtained.

The record requires confirmation.

Fam. **Ungulinidae**

Two gill lamellae on each side (tetrabranch). Foot long, apically swollen. Anterior adductor scar continuing the direction of (united with) the pallial line. (See: Pelseneer, 1911, pl. 13, fig. 6.)

For *Ungulina alfredensis* Bartsch see: *Thracia alfredensis* (p. 573).

For *Cryptodon eutornus* Tomlin see: *Lucina edentula* (p. 470); for *C. subradiatus* Gould see: *Phacoides valida* (p. 472), and *Erycina subradiata* (p. 481).

Gen. DIPLODONTA Bronn

Jaeckel & Thiele (1931) recorded:

Diplodonta africana Bartsch from 34° 51′ S., 19° 37′ E., 80 metres.

Diplodonta (*Felania*) *rosea* Récluz from 35° 16′ S., 22° 26′ E., 155 metres, and 35° 29′ S., 21° 3′ E., 102 metres.

Diplodonta (*Felania*) *agulhasensis* n.sp. see below.

Felaniella alfredensis Bartsch from 35° 26′ S., 20° 56′ E., 80 metres.

The *Pieter Faure* obtained several valves which can be assigned to one of the species hitherto recorded from South Africa, all of which seem to be flattish (complanate). She also obtained several valves, mostly in the Natal area, which are definitely ventricose, and which are here referred provisionally to an East African species.

The specimens on which Turton (1932) based three 'species' of *Diplodonta* and one of *Felania* require re-examination; some of the figures look as if they might be *Crassatella*.

Diplodonta (*Felania*) *subradiata* (Sow.)

Fig. 21 *a*

Felania subradiata Sowerby, 1892, p. 62, pl. 3, fig. 73; Smith, 1904a, p. 25; Turton, 1932, p. 236; Cox, 1939, p. 100.

Felania whitechurchi Turton, 1932, p. 236, pl. 62, no. 1649 (juv.).
Tellina crassa (*non* Pennant) Turton, 1932, p. 249, pl. 67, no. 1755.

Complanate, suborbicular, but slightly trigonal, antero- and postero-dorsal margins gently convex, declivous, umbo subtending an angle of *c*. 115°, nearly equilateral in adult, but anteriorly slightly bulging in juvenile; no lunule; concentric growth-lines only; two cardinal teeth, the anterior in the left, the posterior in the right valve bifid, no laterals.

Length 19–20, alt. 20 mm., thickness (one valve) 4·5 mm.

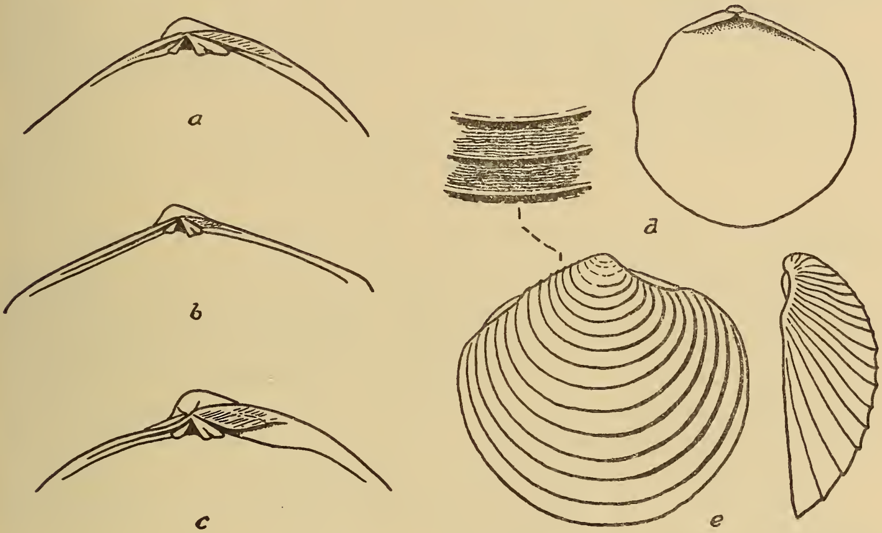

Fig. 21. Hinge (right valve) of: *a*, *Diplodonta subradiata* (Sow.). *b*, *D. agulhasensis* J. & T. *c*, †*D.* cf. *senegalensis* Rve. Internal view of *d*. *Thyasira polygonia* (Gould). *e*, *Phacoides saldanhae* n.sp., with intercostal sculpture further enlarged.

Externally and internally white or pinkish, with or without pink radiating rays; periostracum yellowish-brown; when rays are present they are usually more distinct internally, especially on the ventral margin.

Fossil: Post-Pliocene, Inhambane (Cox).

Port Elizabeth (Sowerby); Port Alfred (Smith, Turton); Still Bay (S. Afr. Mus. Mrs. Connolly coll.).

Off Tugela River (Natal), 37 fathoms, 5 valves; off Morewood Cove (north of Durban), 27 fathoms, one valve; off Umkomaas, 40 fathoms, 5 valves; off Nieca River (East London), 43 fathoms, one valve; off Cape Infanta, 46 fathoms, 5 valves (S. Afr. Mus. P.F. coll.).

False Bay, 26 fathoms, living (U.C.T.; also S. Afr. Mus. coll. Dr. Ackert 1960).

34° 51′ S., 23° 41′ E., 100 fathoms; and Algoa Bay, 14–25 fathoms (U.C.T.).

Remarks. The present series shows that young shells, even up to 15 mm.

long, are distinctly though slightly inequilateral, but the largest shells are almost equilateral.

The specific name refers not to any external surface sculpturing, but to the internal pink rays, often obscure.

Details of the coloration of 4 valves (shells taken alive at Gordon's Bay (False Bay) by Dr. H. Ackert): Length 20, alt. 20 mm. white with two pink rays; 17·5 × 17 mm. white with pink patches on internal margin; 17 × 16 mm. 8 or 9 pink rays on internal margin; 14 × 13 mm. internally pinkish-brown, with rays at margin.

Thanks to Dr. Cain, Oxford University Museum, I have been able to examine Turton's '*Tellina crassa*'; it is obviously a *D. subradiata*; and *whitechurchi* is merely a juvenile.

Diplodonta (*Felania*) *agulhasensis* J. & T.

Fig. 21 *b*

Diplodonta (*Felania*) *agulhasensis* Jaeckel & Thiele, 1931, p. 218, pl. 9(4), fig. 88 (juv.).

Complanate, subcircular but slightly ovoid, being longer than high, nearly equilateral, but posterior half appears slightly larger because the antero-ventral margin is somewhat oblique, antero- and postero-dorsal margins nearly straight, not declivous, umbo subtending an angle of *c.* 130°; no lunule; concentric growth-lines only; 2 cardinals, the anterior in the left, the posterior in the right valve bifid, no laterals.

Length 20, alt. 18·5, thickness (one valve) 3·5 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin); Little Brak River, Mossel Bay (S. Afr. Mus.).

35° 26′ S., 20° 56′ E., 80 metres (Jaeckel & Thiele).

Off Tugela River, 37 fathoms, one valve; off Morewood Cove (north of Durban), 27 fathoms, 5 valves; off Nanquas Peak (eastern end of Algoa Bay), 49 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. Juveniles of this species and *subradiata* are not distinguishable with certainty; and as there will always be this uncertainty, it is preferable to utilize the name *agulhasensis* rather than to institute a n.sp.

Also, the fossil 15–20 mm. shells may be only immature examples of the cf. *senegalensis* recorded from the same deposits (*v. infra*).

Diplodonta cf. *sansibarica* J. & T.

? *Diplodonta rotundata* Mont., Smith, 1903, p. 398.
Diplodonta sansibarica Jaeckel & Thiele, 1931, p. 218, pl. 9(4), fig. 87.

Ventricose, subcircular or a little longer than high, whole circumference evenly curved; no lunule; fine concentric growth-lines producing on live shells a silky appearance, here and there slightly stronger growth-lines indicating resting periods; two cardinals, the anterior in the left, the posterior in the right valve bifid, no laterals.

Length 16, alt. 14, thickness (one valve) 5–5·5 mm.; 14 × 12 × 5 mm.

Dirty cream or white, some of the valves (Umhloti) with a faint pinkish tinge.

Fossil: Pleistocene, Durban north bridge, 60 feet below sea level (Geol. Survey).

Durban (Smith).

Off Tugela River (Natal), 65–80 fathoms, 3 valves; off Tongaat, 36 fathoms, 7 valves; off Umhloti River (Natal), 40 fathoms, 24 valves; off Cape Morgan, 77 fathoms, one valve; off Cape St. Blaize, 125 fathoms, one valve; False Bay, 42 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Living: Inhambane (U.C.T.).

Distribution. Off Dar-es-Salaam (Jaeckel).

Remarks. The specimens are probably conspecific with the shell recorded with a query as *rotundata* by Smith from Durban.

† *Diplodonta* cf. *senegalensis* Rve.

Fig. 21 *c*

Diplotodon [sic] cf. *senegalensis* Rve., Smith in Rogers, 1906c, p. 294.
Diplodonta cf. *senegalensis* Rve., van Hoepen, 1940, p. 191; Barnard, 1962b, p. 185.
Cf. *Diplodonta diaphana* Gmelin, Nicklès 1950, p. 188, fig. 351.

Subcircular, equilateral, no lunule; growth-lines moderately regular on early part, but later varying in strength; 2 cardinals, the anterior in the left, the posterior in the right valve bifid, no laterals, ligament deep.

Length 40, alt. 42, thickness (one valve) 13 mm.

Fossil: Pleistocene, Little Brak River, Mossel Bay (Smith in Rogers; van Hoepen; also S. Afr. Mus. coll. S. H. Haughton); Zwartkops (Port Elizabeth) and Keurbooms River (van Hoepen); Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.).

Remarks. Nicklès recorded *D.* (*F*) *diaphana* from the Quaternary of Benguela, and living from Mauritania to Angola, but did not mention *senegalensis*. One suspects that the two are synonymous, but having no material for comparison I record the present specimens under Reeve's name which has already been used in South African literature by Smith and van Hoepen.

Thyasira investigatoris (Smith)

Cryptodon investigatoris Smith, 1895, p. 13, pl. 2, figs. 6, 6*a*; 1897, pl. 3, figs. 2–2*b*; Sowerby, 1904, p. 12.
Thyasira investigatoris (Smith), Jaeckel & Thiele, 1931, p. 218.

Length 30, alt. 26, thickness (valves together) 22 mm. (S. Afr. Mus.).

Cape Point N.E. ¾ E. distant 40 miles, 720–800 fathoms, one presumably living (Sowerby: P.F. coll.).

33° 50′ S., 17° 21′ E., 600 fathoms, one right valve (S. Afr. Mus. coll. F. H. Talbot, 1959).

Distribution. Off Colombo, Ceylon, 142–400 fathoms (Smith); 1° 50′ N., 96° 53′ E., 1,143 metres (Jaeckel).

Remarks. The P.F. shell (paired valves) was probably taken alive and preserved in formalin before being sent to Sowerby; it is now badly corroded and flaked.

Compare *T. excavata* Dall (1901, *Proc. U.S. Nat. Mus.* xxiii, p. 818, pl. 39, figs. 12, 15) from California.

Thyasira polygonia (Gould)

Fig. 21 *d*

Cryptodon polygonius Gould, 1861, p. 174.
Thyasira polygonia (Gould), Jaeckel & Thiele, 1931, p. 217.

Subcircular, equilateral, 2 shallow grooves on the posterior part (or as in Gould's description: 2 low 'angles', i.e. ridges), ventral margin evenly curved. Concentric growth-lines.

Length and alt. 8 mm. Gould: 4 × 3·5 mm. Faintly pinkish.

Simon's Bay (False Bay) (Gould, collected by W. Stimpson, 1853); St. Francis Bay, 80 metres, and Algoa Bay (Jaeckel & Thiele).

Simon's Bay, 22 fathoms, one living, 2 valves; False Bay, 32 fathoms, 2 living; False Bay, 45 fathoms, 4 valves; Cape Point N. 20° E., 14 miles, 85 fathoms, one living; 34° 5′ S., 25° 55′ E., 67 fathoms, 8 living, 10 valves (S. Afr. Mus. P.F. coll.).

32° 23′ S., 17° 48′ E., 143 metres, 3 living (s.s. *Africana* II, per U.C.T.).

Off Saldanha Bay, 75–150 fathoms; off Lamberts Bay, 92 fathoms (U.C.T.).

34° 26′ S., 21° 48′ E., 37 fathoms; False Bay, 44 fathoms; Plettenberg Bay, 26–61 fathoms; 34° 51′ S., 23° 41′ E., 100 fathoms; Algoa Bay, 68 fathoms (U.C.T.).

Remarks. As Gould said, this is 'more equal in its diameters' than *flexuosus* (Mont.).

Fam. **Lucinidae**

Only one gill on each side (dibranch). Foot variable, vermiform, not apically expanded. Anterior adductor scar projecting within the pallial line. (See: Pelseneer, 1911, pl. 13, fig. 8, pl. 14, figs. 5, 6.)

Lucina edentula (Linn.)

Lucina fragilis (*non* Phil.), Krauss, 1848, p. 5.
Axinus globosus (*non* Forskål), Sowerby, 1889, p. 157.
Loripes globosus (*non* Forskål), Sowerby, 1892, p. 61, pl. 4, fig. 91; Wybergh, 1920, pp. 58, 67.
Cryptodon globosus (*non* Forskål), Schwarz, 1900, p. 61; Smith, 1904a, p. 25; Smith in Rogers, 1906c, p. 294; Schwarz, 1910, p. 116.
Lucina globosus (*non* Forskål), Bartsch, 1915, p. 194; Braga, 1952, p. 118, pl. xi, fig. 6.
Loripes edentula (Linn.), Chenu, 1862, fig. 581; Stow, 1871, p. 517.

Lucina edentula (Chenu), von Martens, 1897, p. 229, pl. xi, figs. 1, 2; Lynge, 1909, p. 167; Prashad, 1932, p. 154 (references); Thiele, 1935, fig. 826; Barnard, 1962b, p. 185.
Cryptodon eutornus Tomlin, 1921, p. 215, pl. 8, fig. 5; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, p. 129.
Lucina (*Cryptodon*) *eutornus* (Tomlin), Turton, 1932, p. 235.

Length 66, alt. 53, thickness 49 mm. (Tomlin); 60 × 53 × 44 mm.; 60 × 56 × 23 (one valve) mm.; 65 × 54 × 24 (one valve) mm. (S. Afr. Mus.).

Fossil: Pleistocene; Klein River estuary, Hermanus (Wybergh); Keurbooms River estuary, Plettenberg Bay (Schwarz; also S. Afr. Mus. coll. K.H.B.); Little Brak River, Mossel Bay (Smith in Rogers; also S. Afr. Mus.); Sedgefield near Knysna (S. Afr. Mus. coll. A. R. H. Martin); Knysna raised beach (S. Afr. Mus.); Zwartkops valley, Port Elizabeth (Krauss, Stow, Schwarz).

Still Bay (S. Afr. Mus. coll. Muir); Port Elizabeth and Zwartkops estuary (Sowerby, Bartsch); Port Alfred lagoon (Smith, Bartsch, Turton); Port St. Johns (S. Afr. Mus.); Durban (Sowerby, Tomlin; also S. Afr. Mus.); Delagoa Bay (Braga; also U.W.).

Living: Knysna (U.C.T.); Durban Bay (U.C.T.); Delagoa Bay (S. Afr. Mus. coll. K.H.B.); Inhambane (U.C.T.).

Distribution. Seychelles, Madagascar, Mauritius, Madras, Indo-Pacific.

Remarks. Examination of examples taken alive showed the dibranch character of the animal.

This estuarine species does not seem to have occurred anywhere on the west coast. The most westerly locality along the south coast at which fossils have been obtained is the Klein River estuary, Stanford. Apparently it is not living there today (1952, Scott, Harrison, & Macnae). It has been found living in the Knysna lagoon by U.C.T., but not recorded (1952, Day, Millard & Harrison).

The correct name for this 'fine and well-known South African bivalve' (Tomlin 1921) was first given by Stow. He perhaps identified it from Chenu's figure 581, as he attributed the authorship to Chenu; or he may have obtained it from W. S. Dallas of the Geological Society of London, to which Society he sent his collection of recent and fossil shells (Stow 1871, Editor's footnote p. 515).

Unfortunately Tomlin was not aware that Lynge (1909) had examined some of Krauss's specimens from Zwartkops, and had thereby confirmed the identity.

Prashad (1932) correctly included Sowerby's 1889 record in his bibliography of *L. edentula*; but incorrectly included Sowerby's 1892 and Smith's 1904a records in his bibliography of *Diplodonta globosa*. Lynge (p. 176) doubted whether Sowerby's 1892 figure 91 was *globosa* Forskål.

Tomlin did not have an animal to examine; but the inset anterior adductor scar shows that the species is a Lucinid, not an Ungulinid.

Cox (1927) did not mention *L. edentula* among the Zanzibar fossils.

Gen. PHACOIDES Blainv.

This name is said to have been used only as a vernacular name, and therefore *Dentilucina* Fischer has been adopted by Iredale and Prashad. Dall, Lamy, Thiele, and other authors, however, retain *Phacoides*.

Phacoides rosea (Angas)

Lucina rosea Angas, 1878, p. 860, pl. 54, fig. 6; Smith, 1910, p. 217.
Lucina columbella (*non* Lam.), Sowerby, 1892, p. 61.
Lucina despecta Smith, 1904a, p. 40 (nom. preocc. Phil.).
Phacoides despecta (Smith), Bartsch, 1915, p. 195.
Lucina contempta Cossmann, 1921, p. 181 (as quoted by Tomlin, 1931) (nom. nov. for *despecta* Smith preocc.); Tomlin, 1931, p. 447.
Loripes rosea (Angas), van Bruggen, 1952, p. 15.
[*Non*] *contempta* Turton 1932 (= *liratula*).

Subcircular, equilateral, a slight groove on posterior part. Regular, close-set concentric costae. Lunule large. Two cardinal teeth and anterior and posterior lateral denticles in both valves. Ligament external (partly). Margin internally finely crenulate.

Up to 20 × 20, thickness (one valve) 6–7 mm.

Natal (Angas); Tongaat (Natal) (S. Afr. Mus.); Inhambane (U.C.T.).

Port Alfred (Smith, Bartsch); Port Elizabeth (Sowerby, van Bruggen, S. Afr. Mus.); Jeffreys Bay (van Bruggen); Still Bay (S. Afr. Mus. coll. Muir).

Phacoides valida (Smith)

Lucina valida Smith, 1904a, p. 40, pl. 3, fig. 19; Turton, 1932, p. 235.
Phacoides valida (Smith), Bartsch, 1915, p. 194.
Lucina liratula (*non* Sow.), Turton, 1932, p. 235, pl. 62, no. 1640.

Inequilateral, but adult less so than juvenile, in the latter antero-dorsal margin more concave and umbo prominent. Radial riblets begin on posterior part of shell at about 2·5 × 2 mm. and on anterior part at about 3·5 × 3 mm., and thereafter on the intervening part. Lateral teeth well developed. Margin internally smooth.

Up to length 12, alt. 11 mm.; juveniles are relatively longer, e.g. 4·5 × 3·75 mm.

Port Alfred (Smith, Bartsch, Turton); Still Bay (S. Afr. Mus. coll. Muir); Kalk Bay, False Bay, living (S. Afr. Mus.).

Remarks. Turton has confused *valida* and *liratula*.

Bartsch (1915) had examples of *valida* but did not compare them with the type of *Cryptodon subradiatus* (transferred to *Erycina*, and in error credited to Carpenter instead of Gould). In some respects Gould's description points to a Lucinid, but Dr. Rehder of the U.S. National Museum kindly compared specimens of *valida* sent to him, and found the two species quite distinct.

A worn and broken valve from off Cape Vidal (Zululand), 80–100 fathoms (S. Afr. Mus. A9678. P.F. coll.) is very similar to *valida*, but in the absence of any records from the coast of Natal, is not definitely assigned to this species.

Phacoides capensis J. & T.

Phacoides capensis Jaeckel & Thiele, 1931, p. 221, pl. 9(4), fig. 92.

Subcircular, or slightly longer than high, equilateral, no groove on posterior part; close-set concentric costae, more or less lamellose, especially near postero-dorsal margin in juveniles, but never very prominent, about 15–20 costae in a distance of 10 mm. on middle part of an adult shell; traces of wrinkles (minor growth-lines) in the intervals. Lunule narrow, elongate; escutcheon narrow. Two cardinal teeth and an anterior dentiform lateral in both valves. Ligament external. Inset part of anterior adductor scar narrow, elongate. Margin internally smooth.

Up to length 37, alt. 34, thickness (one valve) 9 mm.

Algoa Bay (Jaeckel).

Algoa Bay, 52–67 fathoms, 17 valves; off Cape St. Blaize, 125 fathoms, one valve; 36° 40′ S., 21° 26′ E., 200 fathoms, many valves, fresh and worn; off Sebastian Bluff, 40 fathoms, one living, one valve; Struys Bay, 42 fathoms, one valve; 34° 34′ S., 18° 32′ E., 100 fathoms (mouth of False Bay) one living; Simon's Bay, False Bay, 22 fathoms, one valve; off Cape Point, mouth of False Bay, 32–42 fathoms, 3 valves; south of Cape Point, 50 fathoms, 2 valves; Cape Point N. 2° E., 85 fathoms, one living, 2 valves; south-west of Cape Point, 120 fathoms, 3 valves; off Table Bay, 104 fathoms, one living (S. Afr. Mus. P.F. coll.).

Distribution. Great Fish Bay, Angola (Jaeckel).

Remarks. The examples from off Sebastian Bluff, from mouth of False Bay, and from off Table Bay were identified by Sowerby as *borealis* (Linn.), but not recorded in print. This species has been recorded from the North Atlantic, Azores and Canary Islands, Persian Gulf, East Indies and Philippines; it may therefore inhabit South African waters.

P. capensis, so far as Jaeckel's incomplete description goes (he did not mention the lunule) is clearly conspecific with the larger shells identified by Sowerby. Jaeckel did not suspect he had only juveniles. One has the choice of accepting or ignoring Sowerby's identification. As there are in the P.F. collection half-grown and adult shells from Algoa Bay, one of the type localities for *capensis*, I adopt the latter course.

The largest valve in the P.F. collection came from Algoa Bay, the next largest, 33 × 32 mm., from off Sebastian Bluff.

The moderately long series of 78 valves, ranging from 12 to 28 mm. in length, from 36° 40′ S., 21° 26′ E., shows that there is a slight variability in shape. The number and closeness of the concentric costae also varies: between 4 and 10 mm. alt. (the very early part of the shell is often corroded) there may be 12–15 costae, sometimes as many as 20; between 10 and 20 mm. alt. 15–20 costae.

Odhner (1923, p. 8, pl. 1, figs. 3–5) described *Lucina* (*Cavilucina*) *semilirata* from Port Alexander, based on a single empty shell 8 × 7 × 3·7 mm. Port

Alexander and Great Fish Bay are not much more than 50 miles apart. Odhner's specimen should be compared with the *Valdivia* shells.

Phacoides aequalis J. & T.

Phacoides aequalis Jaeckel & Thiele, 1931, p. 221, pl. 9(4), fig. 93.

One specimen, 12 × 10·5 × (valves together) 4·5 mm., agrees with the specimens assigned to *capensis* except in having a shorter and broader lunule, 2 × (valves together) 1 mm., and a broader escutcheon.

Jaeckel did not mention the lunule in his descriptions of either *capensis* or *aequalis*; it is therefore uncertain whether the P.F. material has been correctly assigned to the respective species. The *Valdivia* material should be re-examined.

34° 8′ S., 24° 59′ E., 80 metres (Jaeckel).

Off Cape Infanta, 45 fathoms, one living (S. Afr. Mus. No. 14849. P.F. coll.).

Two specimens, the larger the same size as the above, agree in the shape of the lunule and escutcheon, but the surface is almost smooth, without costae and with only very feebly raised growth-lines.

Buffels Bay, False Bay, 35 fathoms, one living, one valve (S. Afr. Mus. A29662. P.F. coll.).

Remarks. Further research will probably show that *aequalis* is only a synonym of *capensis*.

Phacoides saldanhae n.sp.

Fig. 21 *e*

Subcircular, equilateral, not hollowed on posterior part but the upper half of the posterior margin slightly flattened in the 51 mm. shell and the 22 mm. juvenile. No high keel on either side of the ligament or lunule. Widely spaced (more widely spaced than in *capensis*) lamellose concentric costae, and fine wrinkles in the intervals, variable in number: 5–7 on early part, increasing to 8–10(12) on later part. Umbones corroded. Lunule narrow, elongate. Two cardinal teeth and an anterior dentiform lateral in each valve. Ligament strong, external, in a shallow groove. Inset part of anterior adductor scar narrow, elongate. Margin internally smooth.

White, with a thin buff-coloured, or (in the juvenile) pale pinkish-brown, periostracum; ligament brown.

Length 54, alt. 50, thickness (valves together) 30 mm.; and 51 × 45 × 27 mm.; half grown 22 × 20 × 8·5 mm.

Saldanha Bay area: off Baboon Point, 31 fathoms, 2 living, Types; off Paternoster Point, 80 fathoms, one juv. living (S. Afr. Mus. A4473 (Types), and A5379 (juv.), S. Afr. Mus. P.F. coll.).

St. Helena Bay (32° 27′ S., 18° 06′ E. and 32° 23′ S., 17° 48′ E.) 66 and 143 metres, living (s.s. *Africana*, per U.C.T.). Walvis Bay, 99 metres (U.C.T.).

Remarks. The two large P.F. specimens were identified by Sowerby as *Loripes philippinarum* Hanley. They resemble Hanley's figure of a subcircular shell, and the words in his description: 'distant lamellar ridges, whose intervals are unsculptured' are applicable if by 'unsculptured' he meant without *radial* sculpture (Hanley, 1842–56, p. 348, Suppl., pl. 14, fig. 18 [not 't.12.f.42' as given in text]).

Smith (1895, p. 13) identified an Indian Ocean shell as *Cryptodon philippinarum* (Hanley), but the figure (1897, pl. 4, figs. 6, 6*a*) shows an oblong-oval shell (*c.* 18 × 15 mm.) with closer concentric costae. Jaeckel (1931, p. 221) identified an East Indies shell with this figure, but transferred the species to *Phacoides*, although Smith's figure seems to show a *Cryptodon*-hinge without teeth.

The present specimens agree with the Californian *heroicus* Dall (1901, p. 828, pl. 41, fig. 1); in fact almost every word of Dall's description is applicable to them, except that they lack the flexuosity on the posterior margin. That, however, might be an individual feature; Dall did not state how many specimens he had.

The Eastern American *filosus* Stimpson differs in having a high keel on either side of the ligament and lunule (Dall, 1901, p. 824).

The 54 mm. P.F. specimen is thicker walled than the 51 mm. specimen, and has 6 costae between 10 and 20 mm. alt., whereas the latter has only 5; towards the margin in the former the costae become evanescent.

The juvenile has the posterior margin slightly flattened, and there are 8 costae between 4 and 10 mm. alt., and 8(9) between 10 and 20 mm. alt. Even with this increased number, the costae are quite distinctly more widely separated than in *P. capensis*, and there are several minor wrinkles in each interval as in the larger shells.

The largest *Africana* shell is 47 × 45 × 24 mm.

Although a separate name is here suggested for the Saldanha Bay and St. Helena Bay shells, based on the more widely spaced concentric costae, these shells may be only local variants of *capensis*. Jaeckel & Thiele recorded *capensis* from Great Fish Bay. More material is required to show whether typical *capensis* occurs at other localities on the west coast, or transitional forms rendering the name *saldanhae* unnecessary.

Phacoides semperiana (Issel)

Lucina semperiana Issel, 1869, p. 82; Melvill & Sykes, 1898, p. 46, pl. 13, fig. 1.
Phacoides (*Bellucina*) *semperiana* (Issel), Lamy, 1920a, fig. 211; Pallary, 1926, p. 104, pl. 12, figs. 12^1, 12^2; Dautzenberg, 1929, p. 622.
Phacoides (*Parvilucina*) *semperiana* (Issel), Jaeckel & Thiele, 1931, p. 221.

Shell thick, tumid, antero- and postero-dorsal areas marked off, lunule deep; about 14–15 strong concentric costae, the 13th and 15th sometimes duplicated; finer growth-lines in the intervals; numerous radial riblets in the intervals, but not on the dorsal areas and not actually crossing the summits of the costae. Lateral teeth strong. Margin internally strongly crenulate.

Length and alt. 6, thickness (valves together) 5 mm.

Living: Delagoa Bay (U.W.); Inhambane (U.C.T.).

Distribution. Red Sea, Madagascar, Ceylon, Singapore. Off Dar-es-Salaam, 50 metres (Jaeckel).

Remarks. Mr. A. E. Salisbury kindly compared a specimen with the description in Issel, whose work is not available to me.

Prashad (1932) described *P. macassari* from the East Indies, which seems very much like *semperiana.*

Melvill & Sykes (1898, p. 46, pl. 3, fig. 1) figured a specimen 11 × 10·5 mm. from the Andaman Islands. It appears to be less strongly sculptured, and the radial riblets less closely packed than in the present specimens.

Phacoides peritaphros n.sp.

Fig. 22

Shell thick, tumid, inequilateral, juvenile ovoid, adult with altitude nearly equal to length, antero- and postero-dorsal areas not marked off, anterior margin rounded, posterior margin flattened, lunule distinct; strong concentric lirae, mostly close-set and regular, but at intervals a bare space (sulcus) equal in width to one or two (occasionally 3) lirae, no radial riblets between the lirae or on the bare spaces. Right valve with 2 cardinal teeth, and an anterior and posterior lateral; left valve with one cardinal and an anterior and posterior lateral pit. Margin internally crenulate.

Length 5, alt. 4·8, thickness (valves together) 3·3 mm. Young shells slightly longer than high, but altitude becoming proportionately greater with age, e.g.: 2·5 × 2, 3·2 × 2·75, 3·5 × 3, 4 × 3·5, 4·5 × 4, 5 × 4·8, 6·5 × 6·25 mm.

Off Nieca River (East London area), 43 fathoms, one living, 3 valves (Types); off Nanquas Peak (eastern end of Algoa Bay), 49 fathoms, 2 valves; 34° 5′ S., 25° 55′ E., 67 fathoms, several valves; 34° 5′ S., 25° 43′ E., 52 fathoms, several valves; off Cape St. Blaize, 125 fathoms, several valves (S. Afr. Mus. Nos. A9524 (Types), A9525–A9528 P.F. coll.).

34° 03′ S., 25° 58′ E., 42 fathoms (U.C.T.).

Remarks. Allied to the West African *lamothei* Dautzenberg (1912, p. 100, pl. 3, figs. 50–54) and *congoensis* Jaeckel & Thiele (1931, p. 220, pl. 9(4), fig. 91); differing from the former in having more numerous lirae and no radial riblets, from the latter in shape (*congoensis* is subcircular at alt. 2·5 mm.). The distinctive feature is the deep sulci due to periodic non-formation of the concentric lirae. Up to an altitude of *c.* 2 mm. the lirae are formed regularly, but thereafter irregularity sets in; 3 or 4 bare sulci usually occur, with 4–6 (occasionally as many as 8) lirae between them. The relative height of the lirae and depth of the sulci varies. A shell may reach an altitude of 3·5 mm. before a bare sulcus appears.

Jaeckel made no mention of any irregularity in the lirae in his description of *congoensis*, but his figure shows two sulci.

Lucina tabulata Desh. appears from Chenu's figure (1862, fig. 569) to have a somewhat similar periodic variation in the formation of the lirae.

Loripes philippinarum (Hanley)

Lucina philippinarum Hanley, 1842–56, p. 348. Suppl. pl. 14, fig. 18 (not 't.12.fi.42' as given in text).

Equilateral, rather convex, antero- and postero-dorsal margins nearly straight, slightly sloping, the ventral margin between them evenly curved. Widely spaced, narrow but not lamellose concentric costae, 7 in the first 2 mm. alt., 6 in the next 5 mm., and 7 in the later 11 mm., total 20 (another is just due to be formed at the margin); intervals with fine regular costulae, 5–6 on the early part, increasing to 7–8 near the margin. Lunule well marked but not sunken, 3·5 long, 1 mm. wide. Escutcheon narrow, elongate. Two cardinal teeth, both bifid, and an anterior dentiform lateral. Ligament internal. Inset part of anterior adductor scar only half as wide as the upper oval part. Margin internally crenulate. Buff.

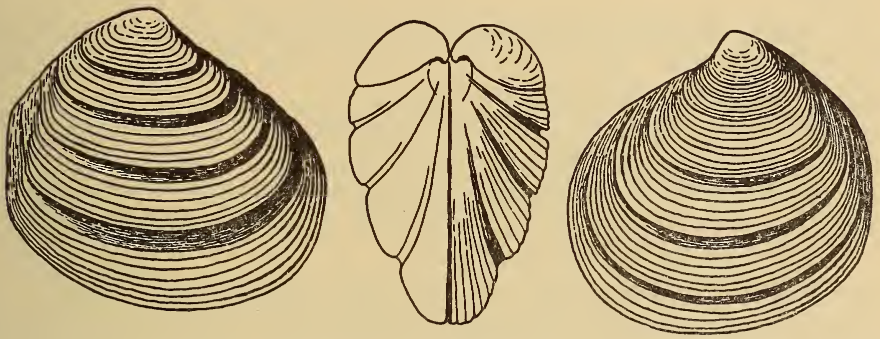

FIG. 22. *Phacoides peritaphros* n.sp. Anterior view, and lateral views of two shells to show variation in the sulci.

Length 16·5, alt. 15, thickness (one valve) 5 mm.

Off Umhloti River (Natal) 40 fathoms, one right valve and one broken (S. Afr. Mus. A9534. P.F. coll.).

Remarks. Provisionally identified with Hanley's species.

This is not the *Cryptodon philippinarum* as figured by Smith (1897, Moll., pl. 4, figs. 6, 6*a*).

Loripes clausus (Phil.)

Lucina lactea (*non* Lam.), Krauss, 1848, p. 4.
Loripes lactea (*non* Lam.), Sowerby, 1889b, p. 155.
Loripes lacteus (*non* Linn.), Sowerby, 1892, p. 61.
Loripes flexuosus (*non* Mont.), Johnson, 1904, p. 11.
Loripes leucoma (*non* W. Turton), Krige, 1933, p. 51.
Loripes clausus (Phil.), Sowerby, 1894, p. 378; 1897, p. 26; Schwarz, 1900, p. 26; Smith, 1904a, p. 40; Smith, 1906b, p. 67; Schwarz, 1910, p. 116; Bartsch, 1915, p. 194; Lamy, 1915, p. 157; Tomlin, 1921, p. 257; Cox, 1927, p. 101, pl. 19, fig. 2; Jaeckel & Thiele, 1931, p. 220; Turton, 1932, p. 235; Braga, 1952, p. 118, pl. xi, fig. 5; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, pp. 41, 129, fig. 23*b*; Broekhuysen & Taylor, 1959, p. 292.
[?] *Lucina jacksoniensis* (*non* Smith), Braga, 1952, p. 117.

Subcircular, equilateral, antero-dorsal part well marked, margin prominent, a slight hollow on posterior part. Fine close-set regular growth-lines, interspersed with stronger lines, surface smooth. Lunule short, deep. Cardinal teeth feeble, anterior and posterior lateral better developed in the left than the right valve. Ligament internal. Inset part of anterior adductor scar elongate, tapering. Margin internally smooth.

Up to length 30, alt. 27–28, thickness (valves together) 14 mm.; Single valves: 35 × 32 × 7, 33 × 32 × 7, 33 × 31 × 11 mm. (S. Afr. Mus.).

Fossil: Pleistocene; Zwartkops valley (Krauss, Johnson, Schwarz); Keurbooms River (Schwarz); Durban (Krige, also Geol. Survey); Zanzibar (Cox).

Knysna (Krauss); Port Elizabeth (Krauss, Sowerby); Port Alfred (Smith, Bartsch, Turton); Durban (Krauss); Delagoa Bay (Braga); Mozambique (Br. Mus. *teste* Sowerby).

Off Port Shepstone (Natal), 250 fathoms, one valve; 36° 40′ S., 21° 26′ E., 200 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Living: Still Bay (S. Afr. Mus. coll. Muir); Knysna (P.F. coll.); Durban (U.C.T.); Kosi Bay (U.C.T.); Delagoa Bay (U.W.); Inhambane (U.C.T.).

Distribution. Zanzibar; Madagascar.

Remarks. Braga's identification of 2 valves from Inhambane as the Australian *jacksoniensis* is not acceptable; probably they were *clausus* or perhaps *rosea*.

Loripes rosacea Smith

Loripes rosacea Smith, 1899, p. 251, pl. 5, figs. 12, 13.
Lucina rosacea (Smith), Cox, 1939, p. 99, pl. 2, figs. 16, 17.

Inequivalve, the left valve convex, the right quite flat. Close-set regular concentric growth-lines, interspersed with sulci (periodic cessation of growth). Pale rose.

Length 17, alt. 18, thickness (valves together) 6 mm. (Smith).

Fossil: Post Pleistocene; Inhambane (Cox).

Durban (Smith).

Off Cape Natal (Durban), 54 fathoms, 2 right valves; off Umhloti River, 40 fathoms, 2 right valves; off Tugela River, 37 fathoms, 3 right valves; juv. (S. Afr. Mus. P.F. coll.).

Remarks. Smith's description did not mention the sulci, and his figures are ambiguous: the thick dark lines might be either the shadows of raised costae or sunken sulci. Cox's photographic figures are better.

The *Pieter Faure* took only right valves.

Divaricella dalliana Vanatta

Lucina (*Divaricella*) *quadrisulcata* (*non* D'Orb.), Sowerby, 1892, p. 26; 1894, p. 378.
Lucina (*Divaricella*) *dalliana* Vanatta, 1901, p. 184, pl. 5, figs. 10, 11; Smith, 1903a, p. 399; 1903b, p. 626.

On the early part of the shell the impressed lines are arcuate, angle of divergence obtuse, but gradually they become more angular, the angle of divergence less obtuse, and on later part of large shells almost a right angle. The smooth radial band, caused by the absence of the impressed lines, begins at about 10–12 mm. alt., but may not occur until 15–20 mm. alt. Two cardinal teeth in left, one in right valve, an anterior dentiform lateral in both valves. Margin internally finely crenulate.

Up to length 29, alt. 28, thickness (one valve) 8 mm.

Natal (Sowerby; also in S. Afr. Mus., without exact locality); Tongaat (30 miles north of Durban) (S. Afr. Mus.); Delagoa Bay (S. Afr. Mus.).

Distribution. Maldive Islands (Smith).

Remarks. The smooth band is constant in all the present valves, and is not due to abrasion.

This smooth band is said to distinguish this South African form from *quadrisulcata*; but does it also distinguish it from *angulifera* von Martens (= *ornata* Rve., non Agassiz) which occurs at Mauritius, Madagascar, Seychelles, and Red Sea? Von Martens's figure of *angulifera* (1880, p. 321, pl. 22, figs. 14, 14*a*) shows no break in the angular lines on a shell alt. 24 mm. (See also: Lamy, 1916, p. 187.)

† *D. mozambicensis* Cox (1939, p. 99, pl. 2, fig. 18) from the Post Pliocene of Inhambane is very similar. The single valve measured 12·5 × 12 mm., and therefore would be comparable with juveniles of *dalliana* before the smooth band has appeared.

A similar smooth band occurs in *perparvula* Dall (1901, pl. 39, fig. 8) from the west coast of Mexico. The figured specimen was 7 mm. in length and the smooth band occupies the distal half of the shell.

Divaricella liratula Sow.

Lucina (*Divaricella*) *liratula* Sowerby, 1889b, p. 155, pl. 3, fig. 5; 1892, p. 61, pl. 2, fig. 63.
Lucina liratula (Sow.), Smith in Rogers, 1906c, p. 294; Haughton, 1932, p. 35.
Lucina contempta (*non* Cossm.), Turton, 1932, p. 235, pl. 62, no. 1641.
[*Non*] *liratula* Turton 1932 (= *valida*).

Subcircular, equilateral, a very slight hollow on posterior part. Fine regular concentric costulae, nearly straight in middle part but undulate anteriorly and posteriorly, obliquely truncated by the major growth-lines which occur at intervals (see Turton's figure), but do not form raised costae. Extremely fine radial striae, often obscure. Lunule narrow. Cardinal teeth 2 in left, one in right valve. Ligament internal. Anterior adductor scar nearly the same width throughout its length.

Up to length 14, alt. 13·5 mm. (S. Afr. Mus.).

Fossil: Pleistocene; Geelbek, Saldanha Bay (Haughton); Little Brak River, Mossel Bay (Smith in Rogers; also S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.); Keurbooms River (Haughton).

Port Elizabeth (Sowerby); Port Alfred (Turton); Still Bay (S. Afr. Mus. coll. Muir).

Remarks. Turton gave a good photo of this species, but in addition to misnaming it, he considered that the sculpturing was abnormal and indicated that the animal had had an 'anxious and troubled life'; the distinctive sculpturing, to which the geological term 'false bedding' might well be applied, is of course quite normal.

Dr. Martin found it very abundant in the Sedgefield deposits.* Also very common in the Mossel Bay deposit. I have not seen the Geelbek (Saldanha Bay) shells, and accept Haughton's identification.

Dr. Muir found only three valves at Still Bay.

Codakia punctata (Linn.)

Lucina (*Codakia*) *punctata* (Linn.), Tomlin, 1931, p. 447.
Codakia punctata (Linn.), Prashad, 1932, p. 155 (references); Macnae & Kalk, 1958, p. 129, fig. 23*k* (labelled *exasperata*).

Flat radial ribs, broad but variable, and narrow shallow grooves; fine regular concentric growth-lines.

Length 71, alt. 69 mm. (Lamy, 1915).

Durban (Tomlin); Delagoa Bay (U.W.).

Distribution. Mauritius, Madagascar, Seychelles, Indo-Pacific.

Remarks. Both this species and the next, *tigerina*, occur at Delagoa Bay, but I feel doubtful about their *living* in Durban Bay. U.C.T. did not obtain either species at Durban, nor at Kosi Bay.

Codakia tigerina (Linn.)

Lucina tigerina (Linn.), Krauss, 1848, p. 5.
Lucina exasperata Sowerby, 1897, p. 26.
Codakia exasperata (Sow.), Macnae & Kalk, 1958, p. 129.
Codakia tigerina (Linn.), Prashad, 1932, p. 156 (references).
[*Non*] *Codakia exasperata*, Macnae & Kalk, 1958, fig. 23*k* (= *punctata*).

Cancellate; narrow nodulose radial ribs, not wider than the grooves.

Up to length 83, alt. 73, thickness (valves together) 48 mm. (U.W.). 92 × 73 mm. (Lamy, 1915).

Durban (Krauss, Sowerby); Delagoa Bay (U.W.); Mozambique Island (S. Afr. Mus. coll. K.H.B.).

Distribution. Mauritius, Madagascar, Seychelles, Indo-Pacific.

Codakia pecten (Lam.)

Lucina (*Codakia*) *pecten* (Lam.), Sowerby, 1894, p. 378; 1897, p. 26.
Lucina (*Jagonia*) *pecten* (Lam.), Dautzenberg, 1912, p. 100; Lamy, 1915, p. 158.

This is a West African shell. I suggest the possibility that Sowerby's shells from Port St. Johns and Durban might have been the Indo-Pacific *divergens*

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* For description of these deposits see: Martin, *S. Afr. J. Sci.* **52**, p. 187, 1956.

(Phil.). The provenance of those shells cannot be checked, and I exclude the species from the South African fauna list.

Fam. **Erycinidae**

Two gills on each side.

The South African representatives of this, and the following family *Montacutidae* require *anatomical* investigation. At present the number of names in the current fauna-list is certainly excessive; both Bartsch and Turton accepted Nature's beach-worn playthings as examples of 'speciation'.

Further, species have been removed from one genus to another, or even from one to the other family. It may be noted that *Kellia natalensis* Smith 1903 (*Rochefortia* in Bartsch 1915) is not the same as *Montacuta natalensis* Smith 1899. To add to the confusion Thiele (1934) made *Rochefortia* a synonym of *Mysella* in the *Montacutidae*.

Many of the species are known to be incubatory, retaining the larvae in the gill-pouches until the shelled-stage; then follows a lengthy pelagic stage until the velum is lost and the mollusc settles down.

Erycina subradiata (Gould)

Cryptodon subradiatus Gould, 1861, p. 33.

Erycina subradiata Carp. [sic = Gould] Bartsch, 1915, p. 197, pl. 46, figs. 5, 6, pl. 49, fig. 2 (= juv.); Jaeckel & Thiele, 1931, p. 222.

Erycina alfredensis Bartsch, 1915, p. 197, pl. 43, figs. 7, 8, pl. 50, figs. 1, 2 (= juv.); Jaeckel & Thiele, 1931, p. 222.

Erycina rifaca Bartsch, 1915, p. 198, pl. 39, fig. 3, pl. 50, figs. 7, 8 (= juv.).

Erycina rugosa Jaeckel & Thiele, 1931, p. 223, pl. 9(4), fig. 95 (= adult).

Prodissoconch minute, but distinct. At 0·5 mm. alt. a constriction occurs, marking off a false prodissoconch; thereafter up to *c.* 2 mm. alt. 3 or 4, sometimes 5, corrugations or wrinkles; thereafter growth-lines only; surface smooth, but extremely finely shagreened (mentioned for *alfredensis* and *rugosa*); in each valve an oblique cardinal tooth, anteriorly and posteriorly a lateral lamella (zahnartige Leiste, Jaeckel; see Bartsch's figures).

Length 9·5, alt. 8, thickness (one valve) 2 mm.

Simon's Bay (False Bay) (Gould, coll. W. Stimpson; Bartsch); Port Alfred (Bartsch, Turton).

St. Francis Bay, 80 metres, and Algoa Bay (Jaeckel).

Simon's Bay, 22 fathoms, 14 valves; Buffels Bay (False Bay), 35 fathoms, 7 valves; Algoa Bay, 67 fathoms, 5 valves (S. Afr. Mus. P.F. coll.).

False Bay, 17–44 fathoms, and Plettenberg Bay, 43 fathoms (U.C.T.).

One juvenile from Lüderitzbucht, 26 metres (U.C.T.) may be this species.

Remarks. The 14 valves, from 3–6 mm. long, from the type locality, together with larger ones from the neighbouring Buffels Bay, demonstrate that *subradiata* was founded on a juvenile, and that *rugosa* is the adult. It is a pity that the latter more distinctive and appropriate name must fall into synonymy.

The distinctive wrinkles around the umbo resemble ripples around a stone dropped into water. They are variable, and sometimes evanescent or even obsolete; which explains why they were not mentioned in the original description or Bartsch's redescription. Often the one or two last formed wrinkles are slightly indented.

Jaeckel's 9 × 7·5 mm. specimen, which he referred to *alfredensis*, was evidently a nontypical specimen without wrinkles.

Very fine radiating striae are occasionally visible either externally or internally. The umbonal constriction was mentioned in the description of *rifaca*, and is clearly shown in Bartsch, pl. 46, fig. 6. This constriction, marking off a false prodissoconch or umbonal boss, is always traceable even when no wrinkles are formed; but is particularly noticeable in strongly wrinkled shells.

Bartsch's other two species from Port Alfred: *ima* and *carifa*, of which I have seen specimens identified and presented by Turton, also appear to be synonymous; also Turton's *becki*, *rietensis*, and *nympha*, each founded on a single valve, and all from Port Alfred. The supposed differences, magnified by an uncritical desire for 'n.sp.', are merely due to the varying effects of beach wear.

Both Bartsch and Jaeckel attributed *subradiata* to Carpenter instead of to Gould.

Bartsch's figure of *carifa* shows well-spaced radiating lines somewhat resembling *Carditella subradiata* Jaeckel, but his figure of the hinge is not that of a *Carditella.*

Gen. SOLECARDIA Conrad (SCINTILLA Desh.)

In addition to one Philippine species reported from Natal, 6 species have been described from South Africa: 4 from Durban, 2 from Port Alfred. The number of specimens on which these 6 species were based is not recorded, except in the case of *turtoni* Bartsch: 6 valves, and *ovalis* Turton: several valves.

The differences between the species appear to be: equilateral or nearly so, or slightly inequilateral; valves a little gaping, scarcely gaping, not gaping, or with ventral gape; oval (5 species) or elongate (one species). Obviously further study is required, especially the study of living examples in the field, and the possible variation in shape, before these 'species' can be accepted.

Turton (1932) also regarded *Kellia crassiuscula* Smith 1890 from St. Helena as a *Scintilla*, and burdened his list of Port Alfred shells with it.

Jaeckel (1931) recorded a shell from Algoa Bay which might be referable to *compta* Sow.

The South African Museum material is as follows:

S. queketti Sow. one shell identified by J. H. Ponsonby; presumably from the original material on which Sowerby based his description, and thus presumably a cotype or topotype. The valves do not gape. One cardinal tooth in each valve (but somewhat obscure) 10 × 6 mm.

Two living specimens from Umzikaba (35 miles north of Port St. Johns) 12 × 7·5 mm. and 6·5 × 4 mm. (coll. F. H. Talbot, 1959).

S. durbanensis Sow. Three shells from Delagoa Bay, living (coll. K.H.B., 1912). With ventral gape. One cardinal in one valve, 2 in the other valve. Shape as in Sowerby's figure, but a little longer (not as elongate as in *elongata*), 11·5 × 6 mm. The surface is minutely and irregularly pitted.

Scintilla sp. Four valves from Still Bay (coll. Dr. Muir) largest 10 × 8 × (one valve) 2·5 mm. Not gaping. Hinge-line worn. One shell from False Bay (U.C.T.), 4·5 × 3·2 mm., seemingly conspecific. One cardinal in one valve, 2 in the other valve. Possibly *turtoni* Bartsch, of which *ovalis* W. H. Turton 1932 seems to be a synonym.

Kellya rubra (Mont.)

Bornia seminulum Phil., Krauss, 1848, p. 2.
Lasaea australis Souv., Sowerby, 1892, p. 62.
Lasaea rubra Mont., Smith, 1903a, p. 395.
Lasaea turtoni Bartsch, 1915, p. 201, pl. 42, figs. 9, 10, pl. 50, figs. 3, 4; Tomlin, 1931, p. 448.
Kellya adansoni Nicklès 1950, p. 193, fig. 363.

Tomlin stated that the previous records of *australis* and *rubra* were due to misidentification, and adopted Bartsch's specific name. Neither Bartsch nor Tomlin detailed the differential specific characters of *turtoni*. Smith identified Burnup's Natal specimens as *rubra*; Dautzenberg (1929, p. 584) recorded *rubra* from Madagascar, and regarded the species as cosmopolitan, viz. Europe, West and South Africa, St. Paul and Amsterdam Islands, Japan, Magellan Straits. Dr. R. K. Dell of New Zealand told me (in litt. 19.i.61) that he was of the same opinion.

On the material at hand I fail to distinguish more than a single species living around the coast of South Africa. The Inhambane specimens do not seem to differ from Natal and Cape specimens.

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Umkomaas (Natal) (Smith).

Table Bay, False Bay, Still Bay, Port Elizabeth, Scottburgh (Natal) (S. Afr. Mus.); Inhambane (U.C.T.). Buffels River and Groen River (south of Port Nolloth) (U.C.T.).

From among the tubes, and in empty tubes of *Vermetus corallinaceus* at Oudekraal (west coast of Cape Peninsula) (U.C.T., also K.H.B.).

Incubatory; larvae retained in the gill-pouches until they have reached the shell stage.

Tellimya rotunda (Desh.)

Erycina rotunda Deshayes, 1856, p. 181.
Kellia rotunda (Desh.), Smith, 1885, p. 202, pl. xi, figs. 5, 5 *a*, *b*; Sowerby, 1892, p. 62, pl. 4, fig. 93; Jaeckel & Thiele, 1931, p. 224.
Kellya rotunda (Desh.), Lynge, 1909, p. 178.
Bornia (*Pythina*) *rotundata* [*sic*] Bartsch, 1915, p. 199, pl. 51, figs. 5, 6; Turton, 1932, p. 229.

Length 10 mm. (Lynge); 10–11 mm. (S. Afr. Mus.); 14 mm. (Smith).

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Algoa Bay (Jaeckel); False Bay and Still Bay (S. Afr. Mus.).

Off west coast of Cape Peninsula (Lion's Head N. 78° E.), 60 fathoms, one living; Buffels Bay (False Bay), 32 fathoms, one living (S. Afr. Mus. P.F. coll.).

False Bay and Plettenberg Bay, 17 and 60 fathoms; also Mossel Bay (U.C.T.).

Distribution. New South Wales, and South Australia; Siam.

Remarks. Tomlin saw South African Museum specimens from False Bay and apparently accepted the identity of South African examples with the Australian species, as did Sowerby, Bartsch, Jaeckel.

If Smith and Lynge are correct, *rotunda* becomes a synonym of the British *suborbicularis* (Mont.) 1803.

The animal agrees with Pelseneer's figure of '*Kellya* sp.' (1911, p. 41, pl. 15, fig. 9). Mantle edges anteriorly forming an inhalent siphon; posterior opening (exhalent) small. Free edges of mantle without papillae. Two gills on each side.

Tellimya biradialis n.sp.

Fig. 23 *a*

Shell thin, semipellucid, nearly equilateral, oval, anterior and posterior ends broadly rounded, ventral margin gently convex; anteriorly and posteriorly 3 or 4 faint radial riblets; whole surface, including riblets, very minutely shagreened. Two cardinal teeth below umbo, and a posterior lamellar lateral tooth. White.

Length 5·5, alt. 4·3 mm.

Off Cape Natal (Durban), 85 fathoms, 2 left valves (S. Afr. Mus. No. A9535. P.F. coll.).

Remarks. In general shape resembling *Lepton fortidentatus* Smith, *Bornia africana* Bartsch, *Bornia oblonga* W. H. Turton, *Rochefortia convexa* (Gould) (figured by Bartsch 1915), and *Rochefortia thalia* W. H. Turton.

Tellimya trigona n.sp.

Fig. 23 *b*

Rounded-triangular, equilateral, umbo slightly in advance of middle line; anterior and posterior margins slightly convex, the anterior margin sometimes convex above and straight below, ventral margin gently convex. Fine close-set concentric lirae; no radial striations, no puncticulation. One cardinal, one anterior and one posterior lateral tooth in each valve.

Two gills on each side.

4·3 × 4·3 mm. White or creamy-white.

Langebaan (Saldanha Bay) and Lüderitzbucht, living (U.C.T.); Cape Flats, sandy deposit inland from present shore line on False Bay coast (S. Afr. Mus.).

Remarks. Mr. Dance (British Museum) to whom specimens were submitted, considered this near to *Pythina triangularis* A. Adams, 1856 from the Philippines; but the latter has a nearly straight, or even slightly indented, ventral margin, and is divided in the middle by an impressed radial line.

The convex anterior margin in some of the Cape Flats shells is rather noticeable, but there is no difference in the sculpture or the hinge.

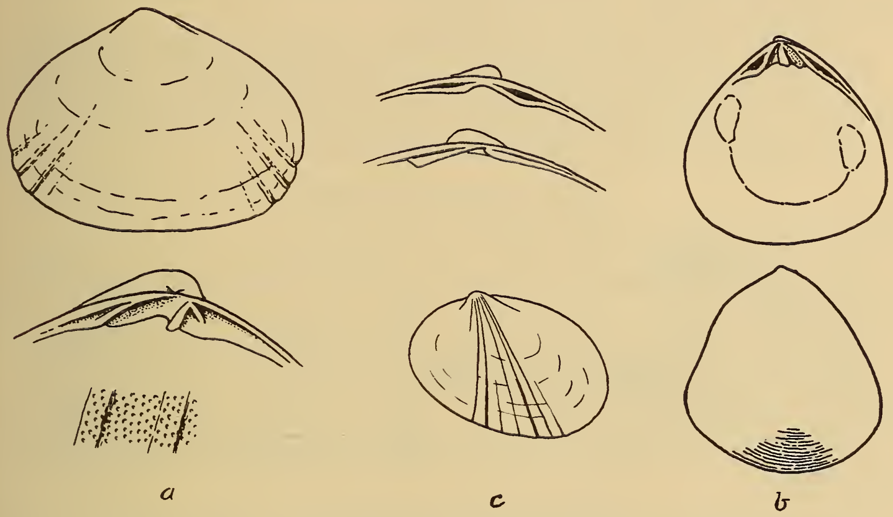

FIG. 23. *a*, *Tellimya biradialis* n.sp., with surface sculpture further enlarged. *b*, *T. trigona* n.sp., right valve (upper), left valve (lower) of variety from Cape Flats (sculpture only partially shown). *c*. Cf. *Montacuta substriata* (Mont.), with hinge.

Tellimya natalensis (Smith)

Kellia natalensis Smith, 1903a, p. 396, pl. 15, fig. 8.

Four valves from P.F. bottom-samples appear to be Smith's species, though they are not nitidulous, and the growth-lines are very distinct, close-set, regular and lirate. 8 × 5·5 mm.; thus slightly larger than Smith's example(s).

Durban (Smith).

Off Cape Natal (Durban), 85 fathoms, 3 valves; off Cape Vidal (Zululand), 80–100 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Lepton sp.

Shell nearly equilateral, compressed, anterior and posterior margins rounded, ventral margin almost straight. Surface with close-set granules in quincunx. Largest specimen length 6·5, alt. 4·5 mm.

Algoa Bay, 67 fathoms, 2 valves; off Cape St. Blaize, 37 fathoms, one valve (the largest) (S. Afr. Mus. A9536, A9537. P.F. coll.).

Apparently related to *squamosum*, but differing in shape.

Lepton fortidentatum Smith

Lepton fortidentatus Smith, 1904a, p. 41, pl. 3, fig. 20.
Lepton fortidentatum Sowerby [err. = Smith] Jaeckel, 1931, p. 223.
Bornia fortidentata (Smith), Bartsch, 1915, p. 198, pl. 50, figs. 9, 10 (hinge); Turton, 1932, p. 238.

Whole valve strongly and closely pitted. Lower margin gently convex. Hinge teeth strong. Pale straw-colour. Up to 6·5 × 5 mm.

Port Alfred (Smith, Bartsch, Turton); Still Bay, and St. James, False Bay (S. Afr. Mus. coll. Muir, and Purcell resp.).

34° 51′ S., 19° 37′ E., 80 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel).

34° 5′ S., 25° 55′ E., 67 fathoms, one valve; off Cape Infanta 46 fathoms, one valve; off Cape Morgan, 77 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Great Fish Bay, Angola (Jaeckel).

Lepton puncticulatum J. & T.

Lepton puncticulatum Jaeckel & Thiele, 1931, p. 223, pl. 9(4), fig. 96.

Very finely shagreened at both ends, but in the middle showing growth-lines only. 9 × 7 mm.

34° 51′ S., 19° 37′ E., 80 metres; 35° 29′ S., 21° 3′ E., 102 metres (Jaeckel).

34° 5′ S., 25° 43′ E., 52 fathoms, 4 valves; 34° 5′ S., 25° 55′ E., 67 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. I suspect that this is only a large form of *Mysella convexa* (Gould) (see p. 488).

Pythina mactroides Hanley

Pythina mactroides Hanley, 1857, p. 340; Nicklès, 1950, p. 193, fig. 364.
[?] *Kellia mactroides* (Hanley), Sowerby, 1892, p. 62, pl. 4, fig. 92.

Shagreened like *Lepton* (or *Bornia*) *fortidentatus* Smith, but more finely. Also distinguished from the latter by the more triangular shape and nearly straight ventral margin.

Specimens 4·25–4·75 mm. long from 'S. Africa', identified by J. H. Ponsonby at the British Museum, are in South African Museum. Specimens from Still Bay, and Port Elizabeth correspond. The East London P.F. specimen is 5 mm. long, and the Knysna one 6·25 mm. The Algoa Bay P.F. specimens assigned to *puncticulatum* (*supra*) range from 6·5 to 10 mm. Nicklès gave 7–12 mm. for *mactroides*.

Cape of Good Hope (Hanley); Port Elizabeth (Sowerby; also S. Afr. Mus., littoral, living); Port Alfred (Smith, Bartsch, Turton).

Off Illovo River (Natal), 27–30 fathoms, one valve; off Nieca River (East London), 43 fathoms, one valve; Algoa Bay, 25 fathoms, one valve; off Knysna, 46 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Mauritania and Senegal (Nicklès).

Remarks. It should be noted that Sowerby's figure of *Kellia mactroides* scarcely differs from that of *Montacuta capensis*. Both are small figures, and useless for critical comparison.

Sowerby's figure of *mactroides* is very different from that given by Nicklès; the latter is more triangular, with a straight or slightly concave ventral margin, whereas Sowerby's figure (as also that of *M. capensis*) shows a convex margin as in *fortidentata*.

Cf. *Tellimya similis* Smith.

Pythina paula A. Adams

Fig. 24 *a*, *b*

Pythina paula A. Adams, 1856, p. 47; Smith, 1885, p. 203, pl. 12, figs. 1, 1 *a*, *b*.
Pythina peculiaris A. Adams, 1856, p. 47.
Tellimya paula var. *peculiaris* (A. Adams), Smith, 1903a, p. 396.*
Montacuta (*Tellimya*) *paula* (A. Adams) Lynge, 1909, p. 182.
Montacuta (*Mysella*) *paula* (A. Adams) Prashad, 1932, p. 172.

Durban (Smith); Inhambane (U.C.T.).

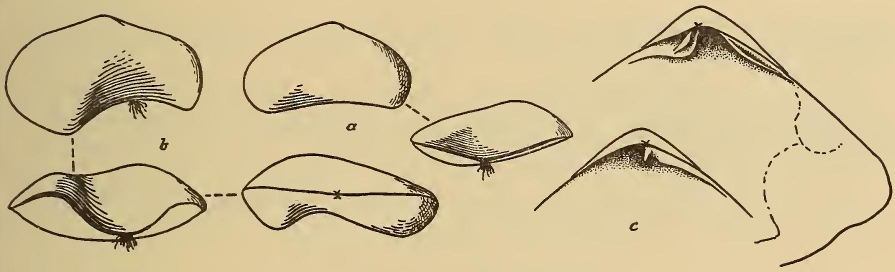

FIG. 24. *a*, *Pythina paula* A. Adams, normal form (5 mm.), *b*, distorted form (6 mm.). *c*, *Rochefortia agulhasensis* J. & T., right valve above, left below.

Distribution. Torres Strait; New Guinea; Siam: East Indies; Ceylon; Aden.

Remarks. The name *pecularis* was given to unusually distorted examples of *paula*.

Bornia africana Bartsch

[?] *Montacuta macandrewi* (Fischer), Smith, 1904a, p. 26; 1906b, p. 64.
Bornia (*Pythina*) *africana* Bartsch, 1915, p. 199, pl. 42, figs. 1, 2, pl. 51, fig. 3 (hinge). Turton, 1932, p. 239.

Bartsch said the outer surface had 'minute tubercles which lend it a shagreened appearance'. None of the specimens I have seen, including one from Port Alfred (coll. & pres. by Turton) have this appearance. Turton said there were 'fine radiating threads'.

In living specimens the periostracum is more or less abraded on the upper (umbonal) half of the shell; but towards the margin it has tiny fimbriate processes along each growth-line. These processes on successive growth-lines are at regular intervals so that they form radial lines, which are still faintly traceable as radiating 'threads' when the periostracum is abraded.

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* Smith quoted his earlier paper as: *Ann. Mag. Nat. Hist.* xiii (1891), p. 235. Lynge and Prashad quoted it as: *Ann. Mag. Nat. Hist.* (6) viii, p. 230; Prashad added: pl. 12, figs. 1, 1 *a*, *b*. This reference to the illustration is the same as in the Challenger Report (1885), which seems unlikely. I am not able to check the reference.

Mantle margin with tiny papillae. Two gills on each side.

Port Alfred (Smith, Bartsch, Turton); Still Bay (S. Afr. Mus. coll. Muir); Gordon's Bay (False Bay) (Dr. H. Ackert); Simonstown (False Bay) (living, Mrs. Connolly).

Remarks. Turton considered this the same as the Port Alfred specimens previously identified by Smith as the Iberian *macandrewi.*

Fam. **Montacutidae**

Only a single gill on each side.

Cf. *Montacuta substriata* (Mont.)

Fig. 23 *c*

Montacuta substriata (Mont.), H. & A. Adams, 1857, **2**, p. 476, pl. 114, figs. 10, 10 *a*, *b*; Thiele, 1934, p. 875, fig. 830.

Closely resembling the above quoted figures, but with only 5 or 6 very faint radial riblets in the middle section of the shell. 3 × 2·5 mm.

34° 51′ S., 23° 41′ E., 100 fathoms, one (U.C.T.).

Remarks. Although only partly ribbed this single shell agrees well with the European species; but a definite identification would be injudicious.

Mysella convexa (Gould)

Kellia convexa Gould, 1861, p. 34.

[?] *Montacuta capensis* Sowerby, 1889b, p. 157, pl. 3, fig. 8; 1892, p. 61, pl. 2, fig. 62; Turton, 1932, p. 239.

Rochefortia convexa (Gould), Bartsch, 1915, p. 199, pl. 45, figs. 1, 2, pl. 47, fig. 4 (juv.), pl. 51, figs. 7, 8 (hinge); Turton, 1932, p. 240.

Triangularly oval, lower margin nearly straight. Minutely shagreened over the whole shell in juveniles up to length *c.* 2–2·5 mm., thereafter confined to anterior and posterior areas. An anterior and a posterior lamellar lateral tooth in each valve, and a central cardinal tooth in left valve. Creamy white (Bartsch: wax yellow). Up to length 7, alt. 5·5 mm.

A long antero-ventral pallial opening, and a posterior opening, mantle edges fused for a short distance between the two openings; free mantle edges without papillae. A single gill on each side.

Simon's Bay, 12 fathoms (Gould); Simonstown, littoral (S. Afr. Mus. coll. Mrs. Connolly); Still Bay (S. Afr. Mus. coll. Muir).

Cape Agulhas, littoral, living (U.C.T.).

? Port Elizabeth (Sowerby); ? Port Alfred (Turton).

Remarks. There is no doubt that the present specimens from the type locality are referable to Gould's species. It is a very common species.

Bartsch did not mention any sculpture except growth-lines in his description of Gould's cotypes. His figure 2 on pl. 45 exaggerates the length of the lateral teeth; figure 7 on pl. 51 omits the cardinal tooth in the left valve, unless the up-turned hook at the proximal end of the anterior lateral tooth is intended to represent it.

Montacuta capensis Sow. is probably a synonym, but the fine surface texture was not mentioned.

Specimens in South African Museum (no. 5609), probably from False Bay, identified by Ponsonby as *mactroides* Hanley 1856, resemble *convexa*; and a direct comparison of Simon's Bay specimens with Hanley's Type (if extant) may show that *convexa* should become a synonym of *mactroides*.

Sowerby's figure (1892, pl. 4, fig. 92) of *mactroides* is very different from that given by Nicklès (1950, fig. 364), and is more like his figure of *Montacuta capensis* (1892, pl. 2, fig. 62); but both figures are small and useless for critical comparison. The finer surface sculpture was mentioned by Nicklès, but not by Sowerby.

Some specimens from Port Elizabeth (coll. R. Kilburn) are more strongly shagreened, almost punctate, but not as strongly as *L. fortidentatum*; the hinge resembles that of *convexa*, not as strong as that of *fortidentatum*.

Lepton puncticulatum J. & T. (see p. 486) has the same sculpturing which is characteristic of *convexa*, and may also become a synonym when more material (living) has been examined.

Rochefortia agulhasensis J. & T.

Fig. 24 *c*

Rochefortia agulhasensis Jaeckel & Thiele, 1931, p. 225, pl. 9(4), fig. 97.

Subtrigonal, anterior end rounded, posterior end somewhat pointed. Surface with growth-lines only, not pitted. In right valve a 'thick plump' anterior tooth and a posterior lamella; in left valve a small median cardinal, in front of which the margin is thickened, no posterior tooth or lamella. Pallial sinus wide but shallow.

Length 4·5, alt. 3·5 mm. (Jaeckel); 8·75 × 6·5 mm. (S. Afr. Mus.).

35° 26′ S., 20° 56′ E., 80 metres, 4 right valves (Jaeckel).

Algoa Bay, 52 fathoms, one left valve; off Cape Infanta, 46 fathoms, one left valve; off Cape Morgan, 45 fathoms, one left valve; off Illovo (Natal), 27–30 fathoms, 2 right valves (S. Afr. Mus. P.F. coll.).

Remarks. Although twice as large, the P.F. specimens are clearly referable to *agulhasensis*. Similar to the North Australian *Montacuta acuminata* Smith 1885, but with stronger hinge teeth.

The 'thick plump' tooth in Jaeckel's description appears to be the ligament shelf, with a small sharp ridge-like tooth.

Fam. **Chamidae**

Odhner, 1919, pp. 1–102, 8 pls.

Chama gryphoides Linn.

Chama gryphoides Krauss, 1848, p. 19; Jaeckel, 1931, p. 226.

This Mediterranean species has twice been recorded from South African waters (Sowerby, 1892, p. 61 merely repeated Krauss's locality): by Krauss from recent deposits (Meeressandstein-Terrassen) on the Natal coast, and by Jaeckel from dredging on the Agulhas Bank.

The lower valve of a Durban specimen (S. Afr. Mus. No. 5582. don. Col. J. H. Bowker, 1888) measures length 36, alt. 39 mm. (aperture 33 × 33 mm.). Both valves are covered with half-cylindrical squamulae arranged concentrically and more or less also radially. The umbonal spiral is clock-wise on the lower, counter clock-wise on the upper valve. Whole margin of both valves finely crenulate. White.

A fresh upper valve from Durban (S. Afr. Mus. A7448. coll. K.H.B., 1912), 23 × 23 mm., is similar, but some of the squamae near the ventral margin are lengthened to 6–7 mm. and flattened. Pale buff.

The *Pieter Faure* obtained valves at three localities: off Tugela River, 14 fathoms, 14 valves; off Cape Natal, 54 fathoms, one juv. 5 mm. valve; off Umkomaas, 40 fathoms, one 3 mm. juv. valve. The Tugela specimens measure up to 15 × 15 mm. None of the upper valves are strongly beaked. Sculpture similar to that of the Durban specimens, and margin internally crenulate (cf. Odhner, 1919, 6, pl. 3, fig. 37, *C. spinosa*).

The *Valdivia* obtained young shells at 35° 16′ S., 22° 26′ E., 155 metres, which Jaeckel referred to *gryphoides*.

The Durban shell No. 5582 was identified by J. H. Ponsonby as *gryphoides* with the comment: '. . . but there is little character in the species of this genus'.

Sowerby (1894, p. 378, and 1897, p. 26) reported *iostoma* Conrad from Natal. A Red Sea and Indo-Pacific species. See: Odhner (1919, p. 76), Prashad (1932, p. 296), and Dall, Bartsch & Rehder (1938, p. 151, pl. 40, figs. 1–4).

Turton's material needs re-examination. His *aenigmatica* (1932, p. 234, pl. 61, no. 1634) however, might be a very worn valve comparable with the *Pieter Faure* specimens.

† *Chama* sp.

Fig. 25

† *Chama* sp. Barnard, 1962b, p. 185.

Somewhat different in character are some fossil (or 'subfossil') shells from deposits in the Keurbooms River estuary (S. Afr. Mus. A7650, coll. K.H.B. 1931). No *Chama* has been recorded from the South African Pleistocene deposits, and it is especially remarkable that none were found by Schwarz when he examined the area (1900, p. 61) because he reported 'Cryptodon globosus' (= *Lucina edentula*) which occurs along with the *Chama* shells.

These shells vary greatly in shape; some are subcircular with a low 'beak', others ovoid with high 'beaks', sometimes very high, like a Gastropod. Measurements: largest 'low-beaked' lower valve length 40, alt. 45 mm.; 'high-beaked' lower valves 45 × 55 and 30 × 60 mm.; the apertures measure respectively 38 × 38, 40 × 40 and 28 × 42 mm. The largest upper valve is 42 × 42 mm.

The umbonal spiral is clock-wise in the lower, counter clock-wise in the upper valve. Lower valves with concentric ridges, more or less lamellose, sometimes strongly so, but irregular; lamellae undulate but not forming separate squamae. In some specimens fine radial striae can be traced on some parts. Upper valve with concentric, more or less lamellose ridges, sometimes near the margin closely imbricate and markedly crinkly. Margin internally in both valves crenulate, but most of the specimens are worn. One upper valve is dull pinkish-orange.

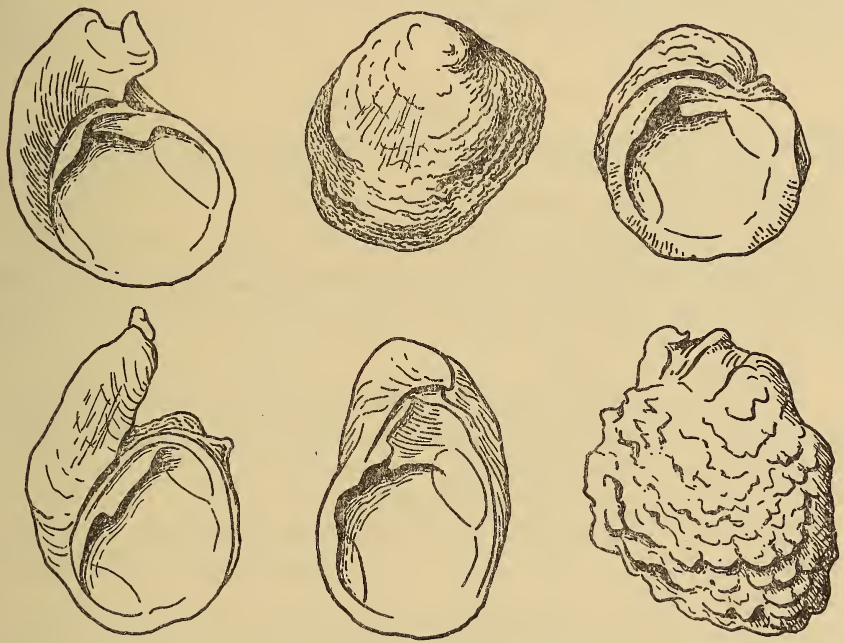

FIG. 25. †*Chama* sp. Keurbooms River estuary.

Among the *circa* 50 specimens collected there are three pairs, i.e. two lower valves firmly grown together, indicating a gregarious habit; and all these have narrow oval apertures and high 'beaks'.

There are also three lower valves and one upper valve from a deposit between Oakhurst and the coast near the Wilderness (George District).

Specimens were submitted to Tomlin, who said 'cannot identify with any Recent species'. This is perhaps too wide a statement in view of Ponsonby's comment (*supra*). In spite of Tomlin's dictum, I think it would be possible, with material for comparison, to assign the name of some Recent 'species' to these Pleistocene fossils; perhaps one of the Red Sea forms, e.g. *cornucopia*

Rve. (*ruppellii* Rve.). Cox (1927, p. 98) recorded *plinthota* Cox (*nom. mut.* for *imbricata* Brod., *non* Lam.) from the Quaternary of Zanzibar.

Krauss's specimens of *gryphoides* were roundish or oval, some with low beaks, others with strongly projecting beaks, with a left to right spiral twist.

Fam. **Cardiidae**

In addition to one specimen of *Papyridea papyracea*, which dwells in lagoons or sheltered bays, the *Pieter Faure* obtained only a very few specimens of *Cardium gilchristi* and *asiaticum*, a moderate quantity of *C. turtoni*, and a single worn valve of *Fragum* sp.

Smith's (1885, p. 162) record of the West Indian *semisulcatum* Gray 1825 (*ringiculum* Sow. 1841 (not 1848 as in Smith)) from Simon's Bay cannot be accepted, as in the case of some West Indian Crustacea (Barnard, 1950, *Ann. S. Afr. Mus.* **38**, p. 3).

Cardium turtoni Sow.

Cardium fasciatum (*non* Mont.), Sowerby, 1892, p. 61; Johnson, 1904, p. 11.
Cardium turtoni Sowerby, 1894, p. 37; 1897, pl. 25, pl. 7, fig. 4; Schwarz, 1910, p. 115; van Bruggen, 1952, p. 16.
Cardium papillosum (*non* Poli), Jaeckel, 1931, p. 227 (part).

Radial ribs (25) 26–27 (28), covered with triangular nodules some of which, chiefly on the anterior and posterior parts and near the margin in large shells, may be subsquamiform; grooves narrower than the ribs, with transverse (i.e. anterior to posterior) punctae.

Length 14, alt. 13 mm.

Fossil: Pleistocene; Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach; Port Elizabeth (Johnson, Schwarz); Durban north bridge, 65 feet below sea level (Geol. Survey).

False Bay to Natal (auct. and S. Afr. Mus.).

False Bay, Struys Bay, off Cape St. Blaize, Algoa Bay, East London area, Umkomaas (Natal) to Tugela River, 22–54 fathoms (S. Afr. Mus. P.F. coll.).

False Bay (U.C.T.).

Remarks. Obviously the *Valdivia* specimens, which Jaeckel identified as the European and West African *papillosum*, belong to the species known in South Africa as *turtoni*. The two species seem to be somewhat similar, and *papillosum* has been recorded as far south as Great Fish Bay, Angola (Jaeckel). Between Angola and the Cape there are no records; U.C.T. has not obtained it on the west coast, and some worn valves in South African Museum labelled as from 'Sea Point, Cape Town' were probably collected at Kalk Bay on the other side of the Peninsula.

Cardium gilchristi Sow.

Cardium gilchristi Sowerby, 1904, p. 11, pl. 7, fig. 1.

Sculpture bipartite: anterior half very finely cancellate, punctate; posterior half with about 18 narrow prickly ribs, with 2–3 (4) closely punctate fine grooves between them; minute prickles may appear near the margin in the intervals between the main ribs. Margin finely serrulate.

Length 12, alt. 13, thickness (valves together) 11 mm. (Sowerby); the Algoa Bay valve in South African Museum 15 × 16 × 6·5 mm.

Algoa Bay, 15 fathoms (Sowerby; P.F. coll.).

Off Cape St. Blaize, 32 fathoms, 2 living; Algoa Bay, 30 fathoms, one valve; off Cape Vidal (Zululand), 80–100 fathoms, one living, 4 valves (S. Afr. Mus. No. 14854, A9673 and A9674. P.F. coll.).

Type ? in British Museum.

Remarks. Evidently a rare species. Although recorded from 15 fathoms in Algoa Bay, it is probably too fragile to be washed ashore either whole or in recognizable fragments. Only one valve was found in the numerous bottom deposits from this area.

Cardium asiaticum Brug.

Cardium asiaticum Brug., Krauss, 1848, p. 12; Braga, 1952, p. 109, pl. 9, fig. 8.
Cardium lima Gmelin, Sowerby, 1892, p. 61.
Cardium burnupi Sowerby, 1897, p. 25, pl. 8, fig. 25; Macnae & Kalk, 1958, p. 129.

Ribs 29–31, anterior ribs retrorse-subsquamose, median ribs serrate, posterior ribs spinose; grooves narrower than ribs, which slope up from the flat floor of the grooves, the line of junction sharply defined; growth-lines fine; ribbed internally except when young.

Length 44, alt. 43 mm.

Fossil: Lower Miocene, Inhambane district (Cox, 1939, with a ?).

Natal (Krauss); Port Elizabeth (Sowerby); Delagoa Bay (Braga; also U.W.). Durban harbour sediments (Dr. Lester King).

Off Umvoti River (Natal), 27 fathoms, 2 living, 2 valves; off Tugela River, 40 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Indo-Pacific.

Remarks. Sowerby in 1892 recorded *lima*, in 1897 described *burnupi* intermediate between *lima* and *aculeatum* Linn., and later (sometime after 1901) identified *Pieter Faure* shells as *lima*.

Cardium flavum Linn.

Cardium flavum Linn., Bruguière, 1797, p. 297, fig. 2; Cox, 1927, p. 99, pl. 19, fig. 1; Prashad, 1932, p. 266 (references).
Cardium rugosum Lamarck, 1819, p. 10; Sowerby, 1897, p. 25; Nardini, 1937, p. 253, pl. 16(10), fig. 17, pl. 17 (11), fig. 1; Braga, 1952, p. 110, pl. 10, fig. 3; Macnae & Kalk, 1958, pp. 117, 129, fig. 23*j*.
Cardium pectiniforme Dautzenberg, 1929, p. 588.

Durban, Natal (Sowerby; S. Afr. Mus.); Delagoa Bay (U.W.); Mozambique (Braga, Franca).

Distribution. Red Sea, Indo-Pacific. Fossil: Quaternary Zanzibar (Cox).

Laevicardium (*Discors*) *lyratum* (Sow.)

Cardium lyratum Sowerby, 1841, p. 109; Hanley, 1843, p. 141, pl. 17, fig. 1; Nardini, 1937, p. 254, pl. 17(11), fig. 3.
Discors lyratum (Sow.), Kira, 1955, p. 108, pl. 54, fig. 19.

I have seen one shell from Inhaca Island (Delagoa Bay) obtained by U.W.

Distribution. Philippines; Japan. Red Sea (fossil).

Papyridea papyracea (Brug.)

Cardium papyraceum Bruguière, 1789, p. 260; Gmelin, 1790, p. 3254.
Cardium natalense Krauss, 1848, p. 12, pl. 1, fig. 9; Sowerby, 1892, p. 61; Turton, 1932, p. 243.
Cardium natalense var. *adjacens* Turton, 1932, p. 243, pl. 65, no. 1710.
Cardium tenuicostatum (*non* Lam.), Sowerby, 1897, p. 25; Braga, 1952, p. 109, pl. 9, fig. 7.

Living shells externally pale olivaceous, more or less faintly mottled with paler yellowish markings, violaceous near the umbones; internally bright chestnut or maroon. In worn shells the internal coloration fades either completely, or remains as a pinkish radial streak from the umbo, together with a pinkish suffusion posteriorly and on margin.

The largest shell present is from Durban (coll. Burnup): length 45, alt. 43 mm.; one from Port Elizabeth 36 × 33 mm.; a worn valve from Still Bay 31 × 28 mm.; the living shell from Still Bay 22 × 20 mm.

Beach valves tend to be more oblong owing to wear on the ventral margin; hence Turton's varietal name is quite unnecessary.

Fossil: Pleistocene, raised beach at Little Brak River (S. Afr. Mus.).

Still Bay, one living, several valves (S. Afr. Mus. coll. Muir); Plettenberg Bay (Inland Fisheries, Cape Province); Knysna (S. Afr. Mus. P.F. coll.); Port Elizabeth (Sowerby; also living, coll. R. Kilburn); Bushmans River mouth (U.C.T.); Port Alfred (Bartsch, Turton); Natal (Krauss: *natalense*; Sowerby: *papyraceum*); Delagoa Bay (Braga); Inhambane (U.C.T.).

Distribution. Indo-Pacific.

Remarks. All the shells at hand, from Still Bay and Knysna to Inhambane, are clearly conspecific. What name is to be used for them? Sowerby (1892) identified *natalense* from Port Elizabeth, and in 1897 added *tenuicostatum* and *papyraceum* from Natal to the fauna-list; Burnup and Tomlin both used *papyraceum*, ignoring *natalense.*

No material is available for comparison, but *Fulvia bullata* and *australis*, judging by figures 3 and 4 on pl. 5 of Kira (1955), are closely allied.

Nardini (1937, p. 255, pl. 17 (11), figs. 4, 5) recorded *tenuicostatum* as a fossil from the Red Sea, and discussed the synonymy.

Fragum fragum (Linn.)

Cardium fragum Linn., von Martens, 1880, p. 324.
Fragum fragum (Linn.), Prashad, 1932, p. 274 (references).

A single worn valve corresponds in shape with the figure of *unedo* in Chenu, 1862, figure 522. Any differences there may be between the 'White Strawberry' (*fragum*) and the 'Red Strawberry' (*unedo*) have been lost on the present valve.

Length 12·5, alt. 12 mm.

Off O'Neil Peak (Zululand), 90 fathoms, one valve (S. Afr. Mus. A9540. P.F. coll.).

Distribution. Red Sea, east coast of Africa, Madagascar, Mauritius, Indo-Pacific.

Remarks. Differing in shape from *Fragum* (*Afrocardium*) *shepstonense* Tomlin (1931, p. 449, pl. 33, fig. 8), which has no distinct umbonal ridge.

Lunulicardia retusa (Linn.)

Lunulicardia retusa (Linn.), Chenu, 1862, figs. 524, 525; Prashad, 1932, p. 287 (references); Gravely, 1941, p. 46, fig. 19 *d*.

The occurrence of this species as far south as Delagoa Bay requires confirmation. It was not recorded by Braga (1952), Macnae & Kalk (1958), nor Franca (1960). Two valves in South African Museum are alleged to have been found at Delagoa Bay.

Distribution. Red Sea, east coast of Africa, Madagascar, Indo-Pacific.

Cardium sp.

Fig. 26 *a*

Subcircular, but with the postero-dorsal margin somewhat rounded-quadrate, equilateral; 25 ribs, the anterior 5 with rounded nodules, the median ribs with transverse bar-like nodules, and the posterior 6 or 7 with obliquely transverse nodules like those on the median ribs but stronger; grooves narrower than ribs. White. Length 7·5, alt. 8 mm.

Inhambane, one living (U.C.T.).

Remarks. Appears to be very similar to the Mediterranean *papillosum*, as figured in Hanley, 1842–56, pl. 17, fig. 6.

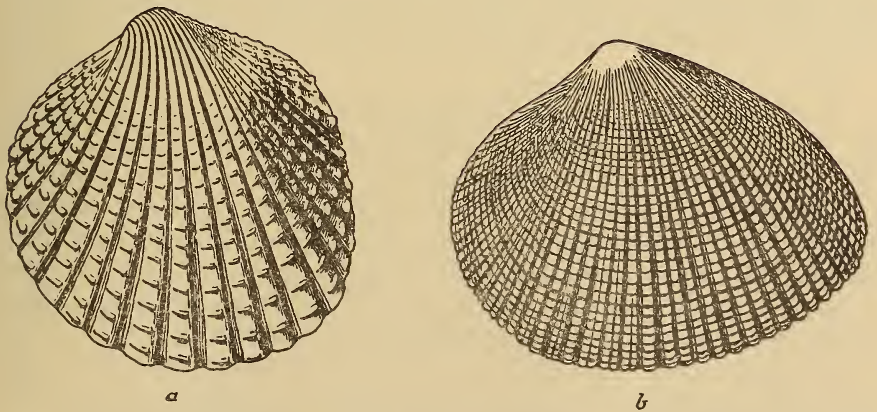

FIG. 26. *a*, *Cardium* sp., Inhambane. *b*, *Chione* (*Timoclea*) *costellifera* (Ad. & Rve.).

Fam. **Tridacnidae**

The species cannot always be distinctly defined because the shells vary in shape and sculpture according to habitat, and according to age.

Tridacna elongata Lam.

Tridacna elongata Lam., Smith, 1906b, p. 64; Hedley, 1921, p. 167, pl. 30, fig. 8; Prashad, 1932, p. 293; Adam & Leloup, 1939, p. 76, pl. 5, fig. 9, pl. 6, figs. 2 and 4.

Smith identified a young shell from Durban (coll. McBean) as probably *elongata*. So far as I am aware no other specimen had been found on the Natal coast until recently a specimen 61 × 29 mm. was found (by Mr. E. W. Meggersee, 1962) in a brain-coral in a sheltered gully at Chaka's Rock (North coast) Natal. The specimen is now in the South African Museum.

Up to 150 mm. (Hedley).

Distribution. Mozambique, Red Sea, East Indies, Indo-Pacific.

Tridacna squamosa Lam.

Tridacna squamosa Lam., Hedley, 1921, p. 172, pl. 28, fig. 3; Prashad, 1932, p. 290 (references); Macnae & Kalk, 1958, pp. 37, 90, 119, 129, fig. 23 C.

Mantle purple and green spotted (Macnae & Kalk).

Up to 370 mm. (Hedley).

West shore, old coral reefs and coral reef fringe, Saco coral reef, Inhaca Island, Delagoa Bay (Macnae & Kalk).

Distribution. Madagascar, Red Sea, East Indies, Indo-Pacific.

Fam. **Veneridae**

Venus verrucosa Linn.

Venus verrucosa Linn., Krauss, 1848, p. 10; Sowerby, 1892, p. 60; Johnson, 1904, pp. 9, 11; Schwarz, 1910, p. 116; Bartsch, 1915, p. 204; Haughton, 1932, p. 35; Day & Morgans, 1956, p. 308; Macnae & Kalk, 1958, p. 129; Franca, 1960, p. 34.
Venus verrucosa var. *capensis* Sowerby, 1889a, p. 14; Turton, 1932, p. 244; Day 1959, p. 539.
Venus intersculpta Sowerby, 1904, p. 11, pl. 7, fig. 2; Jaeckel, 1931, p. 234.
Ventricola verrucosa Newton, 1913, p. 336, pl. 18, figs. 3, 4.

Up to length 60, alt. 53 mm.

Fossil: Pleistocene; Geelbek (Saldanha Bay); Little Brak River (Mossel Bay); Sedgefield near Knysna; Knysna raised beach (S. Afr. Mus.); Keurbooms River (Plettenberg Bay); Port Elizabeth.

Delagoa Bay (U.W.); Natal (Krauss; U.C.T.); Algoa Bay (Krauss, Sowerby); Port Alfred (Bartsch, Turton); Durban, Mossel Bay, Still Bay, False Bay (S. Afr. Mus.). Saldanha Bay (U.C.T.).

Bird Island Passage, Algoa Bay, 10–16 fathoms (Sowerby: *intersculpta*).

35° 16′ S., 22° 26′ E., 155 metres (Jaeckel: *intersculpta*).

Off Cape Vidal (Zululand), 22 fathoms, one living; off O'Neil Peak (Zululand), 55 fathoms, 2 valves; off Itongazi and Umhloti (Natal), 25–40 fathoms, 4 valves; off Cape Morgan, 52 fathoms, one valve; East London area, 22–32 fathoms, one living, several valves; off Great Fish Point, 51 fathoms, one valve; Algoa Bay, 30 fathoms, 3 juv. valves; St. Francis Bay, 24 fathoms, one valve; Knysna, low tide, one living; False Bay, 32 fathoms, 3 valves (S. Afr. Mus. P.F. coll.).

Type of *intersculpta* ? in British Museum; cotype in South African Museum (No. 14841).

Distribution. Mediterranean, Atlantic, Canaries, Cape Verdes, west coast of Africa south to Mossamedes.

Remarks. The whole description of *intersculpta* is applicable to young *verrucosa*; and the cotype, returned by Sowerby with his label, is in fact only a young *verrucosa*.

Although distributed around the South African coast, this species seems to be nowhere common; only a few valves were found in the *Pieter Faure* bottom-samples.

Smith (1901, p. 116) reported *V. declivis* Sow. 1853 from Durban, and also from the gulf of Guinea; was this a misidentification, or is *declivis* only a young *verrucosa*?

Venus arakana (Nevill)

Cryptogramma arakana Nevill, 1871, p. 10, pl. 1, fig. 16.
Venus arakanensis Nevill, 1871, p. 10, pl. 1, fig. 16 [quoted from Smith 1903a]; Smith 1903a, p. 397.
Venus layardi (*non* Rve.), Sowerby, 1892, p. 60.
Venus arakana Sowerby, 1897, pp. 24, 33; Smith, 1906b, p. 65; Cox, 1939, p. 102.
Venus malonei Vanatta, 1901, p. 185, pl. 5, figs. 4, 5.
Chione curiosa Turton, 1932, p. 244, pl. 65, no. 1720 (= juv.).

Up to length 25, alt. 17 mm.

Fossil: Post Pliocene: Inhambane (Cox, 1939); Pleistocene; Durban (Geol. Survey); Sedgefield near Knysna (A. R. H. Martin).

Durban (Sowerby, Vanatta): Port Alfred (Turton).

Living: from Cape Vidal (Zululand), 80–100 fathoms, southwards as far as Cape Natal (Durban), 22–54 fathoms (S. Afr. Mus. P.F. coll.). Particularly common in the *Pieter Faure* bottom-samples from off Morewood Cove (north of Durban), 27 fathoms.

29° 58′ S., 31° 02′ E., 49 metres (U.C.T.).

Distribution. Arakan, Penang, Singapore (Nevill);* Ceylon (Smith).

Remarks. Sowerby's record from Port Elizabeth was probably based on a specimen brought to Port Elizabeth by human agency; unless it had been washed out of some Pleistocene deposit. Not a single valve, or recognizable fragment, was found in any of the *Pieter Faure* bottom-samples from south of Durban, except two worn valves from off Cape Morgan, 45 fathoms. Turton, however, found 2 juv. valves at Port Alfred; and in Pleistocene times it extended as far as the Knysna area.

* These three localities taken together indicate that Arakan is off the coast of Burma; not the Arakan in the Arabian Gulf, 25° N., 63° E., quoted by Bisacchi (1930, p. 61).

A distinctively sculptured shell, even quite small fragments of valves from bottom-samples being easy to recognize.

Chione (*Timoclea*) *siamensis* Lynge 1909, however, is very similar.

Venus reticulata Linn.

[?] *Venus listeri* Gray, Sowerby, 1897, p. 24.
Venus reticulata Linn., Franca, 1960, p. 96, pl. 27, fig. 4.
Antigona reticulata (Linn.), Tomlin, 1931, p. 449; Prashad, 1932, p. 249 (references).

Hinge-line usually red in fresh examples. Length 52, alt. 45 mm. (S. Afr. Mus.).

Umkomaas (Natal) (Tomlin); Natal (S. Afr. Mus.); Delagoa Bay (Franca; also S. Afr. Mus. coll. K.H.B.). Durban harbour sediments (Dr. Lester King).

Distribution. Indo-Pacific. Fossil: Pleistocene; Red Sea, Zanzibar (Cox).

Remarks. V. listeri Gray is a West Indies species. There appears to be very little difference between the two species, except that *listeri* does not have a red hinge-line.

Venus lamellaris (Schum.)

Antigona lamellaris (Schum.), Prashad, 1932, p. 247 (references).

In South African Museum there are two valves labelled 'mouth of the Limpopo' (i.e. Chai Chai, Portuguese East Africa) ex coll. P. Ross Frames. The provenance of these may be accepted because Ross Frames obtained shells of two undoubted South African species: *Bullia natalensis* and *mozambicensis*, at the same locality (Barnard, 1959, pp. 135, 137).

Venus tiara Dillwyn

Chione tiara (Dillwyn), Prashad, 1932, p. 259 (references).
Anaitis foliacea (Phil.), Braga 1952, p. 113, pl. 10, fig. 11.
Venus foliacea Phil., Macnae & Kalk, 1958, p. 129; Franca, 1960, p. 96, pl. 27, fig. 3.

Delagoa Bay (Braga, Franca; also U.W.; also S. Afr. Mus. coll. Dr. J. D. F. Gilchrist, and K.H.B.). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea, Madagascar, Indo-Pacific.

Chione (*Timoclea*) *mindanensis* (Smith)

Fig. 27

Venus (*Chione*) *mindanensis* Smith, 1885, p. 130, pl. 3, figs. 4, 4*a*, *b*.
Chione (*Timoclea*) *mindanensis* (Smith), Prashad, 1932, p. 254, pl. 6, figs. 21, 22.

Subcircular, posterior margin slightly flattened. Radial ribs from (or nearly so) umbo, continuous to margin without bifurcation, and a few interpolated ribs, *c.* 45–50 near the margin on a 10 mm. valve, but those near the postero-dorsal margin difficult to count. Concentric lirae beginning at about 1·5–2 mm. alt., 7 at 4 mm. alt., but thereafter subsidiary ones appear irregularly, towards the margin of the larger valves the lirae may be crowded together, *c.* 25–30; lirae crossing the ribs, slightly lamellose posteriorly, and near the margin on larger valves nodulose. Lunule radially striate. Anterior lateral tooth feeble. Pallial sinus shallow, about $\frac{1}{4}$ distance between adductor scars, rounded. Whole margin finely crenulate internally.

The living shell, and some of the fresher valves, slightly salmon tinted.

Length 10, alt. 9 mm. The living shell (valves together) 6 × 5·5 × 4 mm.

Off O'Neil Peak (Zululand), 90 fathoms, 11 valves; off Cape Natal (Durban), 54 fathoms, 33 valves; off Umkomaas, 40 fathoms, one living, 14 valves; off Hood Point (East London), 49 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Distribution. Philippine Islands, 82 fathoms; East Indies, 55–390 metres.

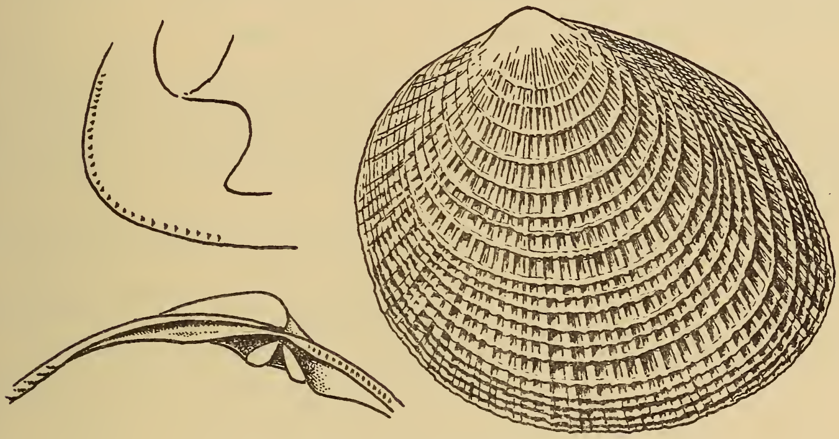

FIG. 27. *Chione (Timoclea) mindanensis* (Smith).

Chione (Timoclea) costellifera (Ad. & Rve.)

Fig. 26 *b*

Venus costellifera Adams & Rve., 1848, p. 79, pl. 21, fig. 18; Sowerby, 1853, p. 718, pl. 157, fig. 106.
Chione costellifera (Ad. & Rve.), Prashad, 1932, p. 256 (references); Braga, 1952, p. 113.

Subtriangular, but slightly longer than high, nearly equilateral, but slightly longer posteriorly. Radial ribs *c.* 50, from umbo to margin, a few intermediaries on anterior half, some of the ribs slightly larger than others towards posterior end, wider than the grooves. Crossed by concentric sulcate growth-lines; at the intersections flat squarish nodules, towards the margin and especially posteriorly projecting, almost squamose. Lunule radiately striate. Pallial sinus shallow, rounded. Margin internally finely crenulate.

Length 10, alt. 8 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Inhambane (Braga).

Off Nanquas Peak (eastern end of Algoa Bay), 63 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, Persian Gulf, Indo-Pacific.

Remarks. Dr. Martin found two valves, the right valve slightly smaller than the above measured left valve. The *Pieter Faure* took only one somewhat worn valve.

The concentric ridges are not really squamose or lamellose posteriorly as in *marica* Linn. or *recognita* Smith (see: Smith 1885, p. 126). There seems to be a close resemblance to the Atlantic *Venus* (*Chione*) *congoensis* Jaeckel (1931, in Thiele & Jaeckel, p. 234, pl. 9 (4), fig. 107).

Comus platyaulax (Tomlin)

Venus latilirata (*non* Conrad), Sowerby, 1897, p. 24, pl. 6, fig. 24.
Venus platyaulax Tomlin, 1924a, p. 114.
Comus platyaulax (Tomlin), Cox, 1930a, p. 20, pl. 4, figs. 2*a–c*, 3*a*, *b*.

All the specimens in South African Museum are worn. The number of concentric ridges therefore uncertain: 8 are visible on the largest valve, but on a smaller valve (alt. 22 mm.) with the umbonal region less worn, there are 9; often a smaller intermediary ridge between the 4th and 5th, or 6th and 7th (visible) ridges. No pallial sinus.

Cream, faintly speckled with pink, 2 carmine radiating streaks. Up to length 31, alt. 28 mm.

Durban (Sowerby); Natal (no exact locality) (Cox; also S. Afr. Mus.); Pondoland coast (seen by me in a private collection).

Off O'Neil Peak (Zululand), 55 fathoms, one juv. valve; off Cape Morgan 45 fathoms, 2 very worn valves (S. Afr. Mus. P.F. coll.).

Type in Durban Museum (1958. *List of Zool. Types in Southern Africa* I, pt. 1, p. 5. Transvaal Mus. Pretoria).

Remarks. Cox's statement that this species had not been taken alive is still true. Cox described also a species from the Pleistocene of Mombasa which appears to belong to this genus.

Sunetta contempta Smith

Sunetta contempta Smith, 1891, p. 422; Sowerby, 1897, p. 24; Wybergh, 1920, p. 66.
Meroë ovalis Sowerby, 1892, p. 59, pl. 3, fig. 69; 1897, p. 33.
Sunetta ovalis (Sow.), Bartsch, 1915, p. 203; Jaeckel, 1931, p. 232; Turton, 1932, p. 244, pl. 65, no. 1718; Franca, 1960, p. 95, pl. 26, fig. 5.
Sunetta ovalis Martin, van Bruggen, 1954, p. 49, fig. 1 *d*, *e*, *f*.
Sunettina sunettina Jouss., Lamy, 1931, p. 306.

Pallial sinus rounded. Length 35, alt. 26 mm. (Sowerby; also S. Afr. Mus.); Franca mentioned specimens up to 39 mm. long.

Fossil: Post Pliocene; Inhambane (Cox, 1939); Pleistocene; Bredasdorp Beds (Wybergh); Sedgefield near Knysna (A. R. H. Martin, 1956); Durban (Geol. Survey).

Port Elizabeth and Durban (Sowerby); Port Alfred (Bartsch, Turton); Tongaat (Natal) living (S. Afr. Mus.); Still Bay, one valve (S. Afr. Mus.coll. Muir); Delagoa Bay (Franca); Beira (Lamy).

33° 50′ S., 25° 48′ E.; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel).

Off Morewood Cove (Natal), 27 fathoms, 4 valves; off Umkomaas, 40 fathoms, 2 valves; off East London, 27 fathoms, 13 valves; Algoa Bay, 25 fathoms, one living, one valve; False Bay, 42 fathoms, one large valve (S. Afr. Mus. P.F. coll.).

Distribution. Aden.

Remarks. The Adenese *contempta* Smith has been recorded from Natal by Sowerby. The present material seems to show that only one species occurs in South African waters, from False Bay to Delagoa Bay; but from the latter locality Braga (1952, p. 112, pl. 10, fig. 6) has recorded *S. truncata* Desh., a synonym of *scripta* Linn.

The single valve from False Bay (P.F.) equals in size the one recorded by Sowerby in 1892.

Van Bruggen, after comparing Tertiary fossils from Java, considered that the name *ovalis* Sow. 1892 was preoccupied by Martin 1880. Comparison of fossil and Recent shells from *widely separated* localities is unsatisfactory, especially in the case of specimens of *Sunetta*; but apart from the possible identity of the two forms, the transference of *ovalis* Sow. from *Meroë* to *Sunetta* makes *ovalis* Sow. *ipso facto* a *nom. preocc.* (presuming Martin put his species into *Sunetta*).

Van Bruggen gave *sunettina* Jouss. 1891 as a synonym of *ovalis* Martin, but Fischer-Piette (1939, p. 144) made *sunettina* a synonym of *contempta* Smith.

In these circumstances one may adopt Smith's name, which has already appeared in the South African fauna-list.

Circe scripta (Linn.)

Circe scripta (Linn.), Prashad, 1932, p. 233 (references); Braga, 1952, p. 111, pl. 10, fig. 5.
Gafrarium scripta (Linn.), Franca, 1960, p. 95, pl. 26, fig. 4.

Delagoa Bay (Braga, Franca; also U.W.). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea, east coast of Africa, Indo-Pacific.

Circe jucunda Smith

Circe jucunda Smith, 1885, p. 144, pl. 2, figs. 3, 3*a*, *b*.

Subcircular; sculpture of concentric growth-lines and radial ribs, the intersections nodulose; ribs gently arcuate, divaricate, 12 anteriorly, 17 posteriorly.

Length 4, alt. 3·75 mm.

Off Cove Rock (East London), 22 fathoms, one right valve (S. Afr. Mus. No. A9541. P.F. coll.).

Distribution. Cape York, North Australia, 28 fathoms.

Remarks. Corresponds with Smith's description and figure. Smith assigned some Honolulu specimens to *jucunda*; but Hawaiian examples have since been described as a different species in a different genus (Dall, Bartsch, Rehder, 1938)!

Both *nana* Melvill 1898 from the Persian Gulf, Indian Ocean and East

Indies, and *salamensis* Jaeckel & Thiele 1931 from Dar-es-Salaam differ in having far more numerous radiating ribs; *salamensis* may well be a synonym of *nana*.

Gafrarium pectinatum (Linn.)

Circe pectinata Linn., Smith, 1904a, p. 25; Macnae & Kalk, 1958, p. 129.
Circe alfredensis Bartsch. 1915, p. 203, pl. 46, figs. 3, 4.
Circe savignyi Lamy, 1931, p. 306.
Gafrarium pectinatum (Linn.), Prashad, 1932, p. 228 (references); Adam & Leloup, 1939, p. 81, pl. 5, fig. 2.
Gafrarium aduncum Franca, 1960, p. 94, pl. 26, fig. 2.
Not: *Crista pectinata* Braga, 1952 [= *divaricata*].

Retains the oval shape of the juvenile throughout life.

Fossil: Post Pliocene; Inhambane (Cox, 1939).

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Natal (Krauss); Tongaat (Natal) living (S. Afr. Mus.); Delagoa Bay (Franca; also U.W.); Chinde (S. Afr. Mus. coll. K.H.B.); Beira (Lamy).

Off Tugela River (Natal), 37 fathoms, 2 valves; off Umkomaas, 40 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Red Sea, Madagascar, Mauritius, Indo-Pacific.

Gafrarium divaricatum (Gmelin)

Circe (*Crista*) *divaricata* Gmelin, Sowerby, 1897, p. 24.
Gafrarium divaricata (Gmelin), Adam & Leloup, 1939, p. 82, pl. 5, fig. 4; Macnae & Kalk, 1958, p. 129.
Gafrarium dispar Prashad, 1932, p. 230 (references)
Gafrarium discors Franca, 1960, p. 94, pl. 26, fig. 3.
Crista pectinata (*non* Linn.), Braga, 1952, p. 111, pl. 10, fig. 4.

Juveniles oval, but a little deeper than *pectinata* of same length, then becoming rounder, and when adult somewhat pointed or cuneiform posteriorly.

Natal (Sowerby); Delagoa Bay (Braga, Franca; also U.W.; also S. Afr. Mus. coll. K.H.B.); Inhambane (Braga).

Distribution. Red Sea, Madagascar, Indo-Pacific.

Pitaria hebraea (Lam.)

Venus paupercula var. *abbreviata* Krauss, 1848, p. 11, pl. 1, fig. 10.
Chione kraussi Deshayes, 1853, p. 54; Schwarz, 1900, p. 61.
Tapes kraussi (Desh.), Sowerby, 1892, p. 60.
Cytherea hebraea Lam., Smith, 1885, p. 138; Sowerby, 1892, p. 59; Day, Millard, Harrison, 1952, p. 410.
Meretrix (*Pitar*) *hebraea* (Lam.), Dautzenberg, 1929, p. 597; Macnae & Kalk, 1958, p. 129.
Caryatis hebraea hebraea (Lam.), Jaeckel, 1931, p. 233.
Not: *Cytheraea hebraea*, Sowerby, 1851, p. 641, pl. 134, figs. 143, 144, 148 [= *sowerbyi* Desh. 1853].

Length 37, alt. 30, thickness (valves together) 23 mm. (Durban specimen).

Broad concentric zones of russet-brown with narrow white intervening zones, uninterrupted or variously interrupted by white radiating streaks of varying width, anterior and posterior margins white. Sometimes zigzag brown markings.

Fossil: Pleistocene; Knysna (Schwarz).

Natal (Krauss, Sowerby); Durban Bay (S. Afr. Mus. coll. Burnup); Delagoa Bay (U.W.). Durban harbour sediments (Dr. Lester King).

Agulhas Bank from St. Francis Bay to False Bay (Jaeckel).

Living: Knysna, and 34° 15′ S., 25° 5′ E., 6 fathoms; 34° 29′ S., 21° 49′ E., 40 fathoms; 34° 37′ S., 21° 56′ E., 47 fathoms; Algoa Bay, 90 fathoms. (U.C.T.) Off Great Fish Point, Algoa Bay, off Knysna, Struys Bay, False Bay, 32–63 fathoms (S. Afr. Mus. P.F. coll.).

Also valves from the same P.F. localities, and intermediate localities, including Brown's Bank (approx. 36½° S., 21¼° E.), 80–100 fathoms.

Distribution. Madagascar, Indo-Pacific.

Remarks. The figure of *abbreviata* corresponds so closely, including the pallial sinus, with specimens identified by Sowerby and Tomlin that I do not hesitate to bring Krauss's variety, later named *kraussi* by Deshayes, into the synonymy.

Pitaria florida (Lam.)

Cytherea florida Lamarck, 1818, p. 565.
Venus pulchra Wood, 1828, pl. 2, fig. 16.
Cytheraea pulchra (Wood), Sowerby, 1851, p. 624, pl. 130, fig. 73.
Cytheraea semisulcata Sowerby, 1851, p. 624, pl. 131, fig. 82.
Cytheraea erycinella Sowerby, 1851, p. 624, pl. 131, fig. 85.
Macrocallista florida Tomlin, 1923, p. 51.

Anterior half concentrically grooved, posterior half smooth.

Length 39, alt. 27, thickness (valves together) 18 mm.

Durban (Tomlin); Inhambane (S. Afr. Mus. coll. Ross-Frames). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea, Mozambique, Madagascar, Seychelles.

Pitaria manillae (Sow.)

Cytheraea manillae Sowerby, 1851, p. 634, pl. 136, figs. 180, 181; ? Sowerby, 1897, p. 24.
Dione manillae (Sow.), Deshayes, 1853, p. 75.
Pitar manillae (Sow.), Prashad, 1932, p. 221 (references).
† *Chamelea schwarzi* Newton, Barnard, 1962b, p. 185.

Prashad seems to agree with Römer that young shells are less trigonal (pointed posteriorly) than shown in Sowerby's figures; this is not very noticeable in the present material. One of the larger valves nearly coincides with the outline of Sowerby's figure 181, but the postero-dorsal margin is slightly convex; cf. figure 188 of *belcheri.*

Shells taken alive are cream or fawn, internally white or faintly pinkish.

Length 21·5, alt. 19 mm. (a Durban valve); a living Tugela shell: 20 × 17·5 × 13 mm.

Fossil: Pleistocene, raised beach Jeffreys Bay (A. V. Krige, 1927), also Knysna (S. Afr. Mus.).

Durban (S. Afr. Mus. coll. Burnup); Tongaat (north of Durban) (S. Afr. Mus.); Port St. Johns, one valve (S. Afr. Mus.).

Off Umhloti River, 27 fathoms, 7 living, several valves; also 40 fathoms, 4 living, several valves; off Tongaat, 36 fathoms, many valves; off Tugela River, 11–14 fathoms, 2 living; also 50 fathoms, 7 living (S. Afr. Mus. P.F. coll.). 29° 53′ S., 31° 06′ E., 71 metres, living (U.C.T.).

Distribution. Philippine Islands.

Remarks. Prashad (loc. cit., p. 222), after examination of the specimens recorded from Natal by Sowerby in 1897, regarded them as misidentified; but he did not state to what species he thought they should have been referred. Burnup identified his Durban specimens as *manillae*; and Sowerby identified *Pieter Faure* specimens as *manillae*.

I maintain the name *pro tem.* as it has appeared in the South African fauna-list; but South African specimens should be compared with *belcheri*, Sow. 1851.

I consider the fossil *Chamelea schwarzi* Newton 1913 (with *rogersi* Newton 1913 as synonym) from the Zwartkops deposits, Port Elizabeth, to be corroded examples of *manillae*. Specimens of *schwarzi* vary in size from 22 mm. long (S. Afr. Mus.) to 29 mm. (Type: *schwarzi*), 36 mm. (S. Afr. Mus.) to 45 mm. (Type: *rogersi*). The pallial sinus corresponds with that of *manillae*.

C. krigei Hghtn. 1926 from deposits on the west coast and from the Bredasdorp beds, is larger, up to 57 mm. long, but otherwise distinguishable only by a slightly wider pallial sinus.

Pitaria kochii (Phil.)

Venus kochii Philippi, 1843, p. 41, pl. 1, fig. 5; Sowerby, 1853, p. 738, p. 158, figs. 147–151.
Venus paupercula (*non* Chemn.), Philippi, 1844, p. 63, pl. 4, fig. 5.
Chione kochii Deshayes, 1853, p. 150.
Chione ambigua Deshayes, 1853, p. 153; Smith, 1903a, p. 397; Macnae & Kalk, 1958, p. 129.
Gomphina ambigua (Desh.), Day & Morgans, 1956, p. 307.
Tapes kochi Sowerby, 1892, pp. 59, 60.
Meretrix kochi (Sow.), Smith, 1904a, p. 25.
Marcia kochii (Sow.), Jukes-Browne, 1915, p. 284.
Anomalocardia alfredensis Bartsch, 1915, p. 203, pl. 44, figs. 3, 4; Turton, 1932, p. 244; Franca, 1960, p. 96, pl. 27, fig. 5.
Cryptogramma alfredensis (Bartsch), Braga, 1952, p. 112, pl. 10, figs. 8, 9.

Length 40, alt. 30, thickness (valves together) 25 mm. A single Still Bay valve 42·5 × 31 mm. A fossil valve 40 × 32 mm.

Fossil: Pleistocene; between Oakhurst and the coast (George–Wilderness district) (S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin); Durban (Geol. Survey).

Port Alfred, estuary of the Kowie River (Smith, Bartsch, Turton); Keurbooms River estuary, Plettenberg Bay (S. Afr. Mus. coll. K.H.B.); Still Bay (S. Afr. Mus. coll. Muir); Durban Bay (Krauss; also U.C.T.; also S. Afr. Mus.); Umlalazi, near Richards Bay (U.C.T.); Delagoa Bay (Braga, Franca; also U.W.; also S. Afr. Mus. coll. K.H.B.); Beira (S. Afr. Mus. coll. R. M. Lightfoot). Durban harbour sediments (Dr. Lester King).

Distribution. Mozambique, Zanzibar (Sowerby).

Remarks. Turton stated that the bivalve described by Bartsch as a n.sp., had previously been identified by Smith as *kochii*. It would indeed be surprising if this common species had remained undescribed until 1915.

It occurs in lagoons and estuaries, and in enclosed bays as at Durban and Delagoa Bay; and consequently was not taken by the *Pieter Faure*.

There is in South African Museum one shell, 24 × 15 × 10 mm., from Durban, which is relatively more elongate than the shells referred to *kochii*. The umbones are 9 mm. from the anterior margin, the postero-dorsal margin is straight, the postero-ventral margin not indented. Cream, with 2 widely separated brown radiating streaks. It resembles Sowerby's figure 160 on pl. 159 (1853) of the West and East African *floridella* (Gray), except for the straight postero-dorsal margin.

Macrocallista lilacina (Lam.)

Cytheraea lilacina Lamarck, 1818, p. 564; Sowerby, 1851, p. 626, pl. 130, fig. 74.
Macrocallista lilacina (Lam.), Haughton, 1932, p. 36; Barnard, 1962b, p. 185.

The Geelbek specimens, 67 × 47 mm., were thus identified by Tomlin. A Redhouse valve, 73 × 50 mm. (S. Afr. Mus. Palaeontol. Reg. No. 7722), has a similar shape and hinge-teeth, but a more broadly rounded pallial sinus. The Knysna valves, the largest 54 × 37 mm., have the pallial sinus as in the Geelbek specimens.

I have no material for comparison, and record these specimens under the name suggested by Tomlin. The shell of this species is grooved throughout.

Fossil: Pleistocene, Geelbek (Saldanha Bay) (Haughton); Redhouse (Port Elizabeth) (S. Afr. Mus.); Knysna raised beach (S. Afr. Mus.).

Distribution. Indo-Pacific.

Remarks. Cox (1927, p. 58, pl. 9, figs. 7, 8) recorded the Indo-Pacific *M. erycina* (Linn.) from the Lower Miocene of Pemba Island.

Gen. TIVELA Link

The three species: *compressa*, *polita*, and *natalensis* are distinct, but the status of *dunkeri*, *hartvigii*, *transversa* and *rejecta* is uncertain.

Pallial sinus subacute, its dorsal margin sloping downwards towards ventral margin.	
Fawn, uniform or with radial streaks, escutcheon reddish-brown.	
Length-height e.g. 19 × 16 mm., 42 × 34 mm.	*compressa*
Length-height, e.g. 21·5 × 15·5 mm., 42·5 × 31 mm.	*transversa*
Pallial sinus subacute, its dorsal margin horizontal and its apex sloping slightly upwards	*dunkeri*
Pallial sinus rounded.	
Postero-dorsal margin convex.	
Length-height e.g. (juv.) 15·5 × 14 mm.	*natalensis*
Length-height e.g. 15·5 × 11·5 mm.	*rejecta*
Postero-dorsal margin straight	*polita*

Tivela compressa (Sow.)

Cytheraea compressa Sowerby, 1851, p. 616, pl. 128, figs. 33, 34.
Tivela compressa (Sow.), Smith, 1914, p. 3, pl. 1, figs. 6–8; Wybergh, 1920, p. 66; Jaeckel, 1931, p. 232.
Tivela tomlini Haughton, 1932, p. 36, pl. 4, figs. 1, 2; Barnard, 1962b, p. 186.

Uniform fawn coloured, or more usually cream with fawn radial streaks varying in number and width; the escutcheon deeper fawn or reddish-brown.

Up to length 61, alt. 50, thickness (one valve) 15 mm. Other shells (valves together) 19 × 16 × 9; 47·5 × 41 × 23; 57 × 49 × 29 mm.

Fossil: Pleistocene; Bredasdorp Beds (Wybergh); Little Brak River (S. Afr. Mus.); Langebaan (Saldanha) (Haughton: *tomlini*).

False Bay to Natal (*auct.*); False Bay, 10–14 fathoms (S. Afr. Mus. P.F. coll.); False Bay (U.C.T.).

Remarks. I have examined the Type of *tomlini*; it is a rather heavy example of *compressa*. The pallial sinus, faintly seen in figure 2, agrees with that of *compressa*.

Tivela transversa (Sow.)

Cytherea transversa Sowerby, 1897, p. 23, pl. 7, figs. 2, 3.
Tivela transversa (Sow.), Jaeckel, 1931, p. 232; Barnard, 1962b, p. 186.

Pallial sinus and coloration as in *compressa*. The following measurements of (2-valved) shells seem to indicate that *transversa* is an elongate form of *compressa*: 21·5 × 15·5 × 8·5 (False Bay, together with typical *compressa*); 26 × 20 × 10·5; 27·5 × 21 × 11·5; 32 × 22·5 × 11·5; 33 × 25 × 13·5; 39 × 30·5 × 15·5; 40·5 × 32 × 17; 42·5 × 31 × 16; and 50·5 × 39·5 × 23·5 mm.

Fossil: Pleistocene; Sedgefield near Knysna (A. R. H. Martin); Little Brak River, Mossel Bay (S. Afr. Mus.).

Natal (Sowerby); St. Francis Bay, 80 metres (Jaeckel).

Off Durnford Point (Zululand), 13 fathoms, 2 living; off Umtwalumi River (Natal), 25 fathoms, one living; off Hood Point (East London), 26 fathoms, one living; Algoa Bay, 33 fathoms, one valve; St. Francis Bay, 24–34 fathoms, one valve; Mossel Bay, 14 fathoms, 2 living; False Bay, 9–14 fathoms, 2 living (S. Afr. Mus. P.F. coll.).

Remarks. The Zululand, Natal, and Mossel Bay specimens were identified by Sowerby. They all possess the pointed pallial sinus characteristic of *compressa*. Sowerby's original figure shows a rounded sinus; but perhaps this may be taken as an error, unless examination of the Type shows it to be correct.

A comparable species *T. petiti* Dautzenberg (1929, p. 594, pl. 7, figs. 1–5) has been described from Madagascar.

Tivela dunkeri (Römer)

Venus dunkeri Römer, 1864, p. 5, pl. 5, fig. 1 [quoted from Smith].
Tivela dunkeri (Römer), Smith, 1914, p. 4, pl. 1, figs. 9, 10.

Smith's figure shows a pointed pallial sinus, as in *compressa* and *transversa*, with its apex slightly upturned, as is seen in some of the above-recorded shells of *transversa*, though the upper margin tends to slope downwards.

A similar pointed and apically upturned sinus is seen in a 15 × 10 mm. shell from off Cape Vidal (Zululand) 22 fathoms (S. Afr. Mus. No. 14874. P.F. coll.), which Tomlin identified as an elongate example of *hartvigii* Dnkr.!

As a synonym of this latter species Tomlin regarded *rejecta* Smith (1914, pl. 1, fig. 11) figured with a narrow and apically *rounded* sinus.

I therefore regard *dunkeri*, *hartvigii*, and *rejecta* as requiring further investigation before admitting them to the fauna-list.

T. lamyi Dautzenberg (1929, p. 592, pl. 6, figs. 1–6) from Madagascar, is donaciform, with the anterior end longer than the posterior, but with the pallial sinus apically rounded.

Tivela polita (Sow.)

Cytheraea polita Sowerby, 1851, p. 618, pl. 127, fig. 14.
Cytheraea dolabella Sowerby, 1851, p. 619, pl. 127, fig. 15.
Tivela dolabella (Sow.), Smith, 1877, p. 720; Dautzenberg, 1929, p. 592; Lamy, 1931, p. 306; Cox, 1939, p. 101.

Cream or pale buff, often with a bluish tinge, or livid concentric bands, uniform or with faint radial streaks, internally violaceous.

Length 46, alt. 36, thickness (valves together) 16·5 mm.

Fossil: Post Pliocene; Inhambane (Cox, 1939); Pleistocene; Durban (Geol. Survey).

Natal (Sowerby; also S. Afr. Mus. coll. L. Kent); St. Lucia Bay, Zululand (U.C.T.); Chinde (S. Afr. Mus. coll. K.H.B.); Beira (Lamy). Sowerby's 1892 record (of *dolabella*) from Port Elizabeth can be ignored.

Distribution. Red Sea; Quelimane; Madagascar.

Remarks. A specimen 20·5 × 18 mm. from Chinde has very prominent umbones, especially the right one; the cardinal teeth in the left valve are more or less fused into a conical mass which fits into a hollow on the right valve, anterior lateral tooth present in both valves.

Sowerby's statement (1892, p. 58) that his *polita* is 'merely the young' of *compressa* is obviously incorrect.

Tivela natalensis Dnkr.

Tivela natalensis Dunker, 1864, p. 101; Turton, 1932, p. 243; van Bruggen, 1952, p. 16.
Cytherea alucinans Sowerby, 1897, p. 24, pl. 7, figs. 5, 6.

Juvenile with fawn or orange-brown transverse irregular wavy or zigzag markings, adult uniform cream or fawn.

Up to length 81, alt. 67, thickness (valves together) 37 mm. (S. Afr. Mus.).

Fossil: Post Pliocene: Inhambane (Cox, 1939). Pleistocene; Durban (Geol. Survey).

Natal (Sowerby); Durban Bay (S. Afr. Mus. coll. Col. J. H. Bowker, 1887). Turton reported examples from Port Alfred, and van Bruggen one from Jeffreys Bay; but it is very doubtful if this species lives as far south even as Port Alfred.

Remarks. Juveniles may be distinguished from *polita* not only by the zigzag markings, but by the convex postero-dorsal margin. Not so flat as † *baini* Newton 1913 (see Barnard, 1962b, p. 186).

Tapes corrugata (Gmelin)

Venus obsoleta Chemnitz, 1784, p. 50, pl. 42, fig. 444.
Venus corrugata Gmelin, 1790, p. 3280.
Venus senegalensis Gmelin, 1790, p. 3282.
Tapes pullastra Montagu, 1803, p. 125; Sowerby, 1852, p. 693, pl. 149, figs. 85, 86.
Venus pullastra (Mont.), Krauss, 1848, p. 12.
Tapes dactyloides Sowerby, 1852, p. 691, pl. 150, fig. 129; Schwarz, 1910, p. 116; Lamy, 1931, p. 306.
Paphia dactyloides (Sow.), Turton, 1932, p. 245.
Tapes corrugata (Gmelin), Sowerby, 1852, p. 691, pl. 150, figs. 121, 122; Smith, 1904a, p. 25; 1906b, p. 65; Smith in Rogers, 1906c, p. 294; Schwarz, 1910, p. 116; Wybergh, 1920, p. 66; Day, 1959, p. 539.
Venerupis cordieri (*non* Desh.), Sowerby, 1892, pp. 59, 60.
Venerupis rugosa (*non* Desh.), Sowerby, 1892, pp. 59, 60; Schwarz, 1910, p. 115.
[?] *Venerupis lajonkari* (*non* Payr.), Sowerby, 1897, p. 25.
Venerupis robusta Smith, 1904a, p. 25.*
Venerupis corrugata (Gmelin), Nicklès, 1950, p. 203, fig. 388.
Venerupis corrugata var. *senegalensis* Nicklès, 1950, p. 204, fig. 389.
Tapes disrupta Römer (*non* Sow.), Smith, 1903a, p. 397.
Paphia disrupta Römer (*non* Sow.), Bartsch, 1915, p. 204.
Paphia corrugata (Gmelin), Haughton, 1932, p. 36; Turton, 1932, p. 245.
Venus corrugata Gmelin, Lamy & Fischer-Piette, 1939, pp. 464, 465.

Young shells up to *c.* 15 mm. long finely cancellate with concentric and radial striae; later the radial striae become evanescent and obsolete, while the concentric lirae become stronger, posteriorly more or less lamellose, medianly and anteriorly more or less rugose and corrugated. Shells living in sheltered situations (e.g. Langebaan) may retain the smooth, finely cancellate surface (*senegalensis* (syn.) *pullastra*) until larger (up to 35 mm. long or even larger), than those living in exposed situations. The development of the Λ-shaped rugosities varies; sometimes it may be present only on the middle part of the shell, which is anteriorly lirate and posteriorly lamellosely lirate. The change from the smooth (*senegalensis*) to the rugose (*corrugata*) may be abrupt.

The shape also varies, e.g. 34 × 20 and 32 × 24 mm., and distorted shells are not infrequent.

Up to length 77, alt. 48 mm.

Fossil: Pleistocene; Bredasdorp Beds; Little Brak River (Mossel Bay); Keurbooms River (Plettenberg Bay); Port Elizabeth; Saldanha Bay, Bogenfels (South West Africa). (See: Haughton.)

Walvis Bay and Saldanha Bay to Natal (auct.). Walvis Bay, Lambert's Bay, Table Bay, False Bay, Still Bay (S. Afr. Mus.). False Bay, 0–11 fathoms (S. Afr. Mus. P.F. coll.). Lüderitzbucht, and Langebaan (Saldanha Bay) (U.C.T.).

Distribution. Europe, Mediterranean, west coast of Africa to Angola.

Tapes textile (Gmelin)

Tapex textile (Gmelin), Sowerby, 1852, p. 681, pl. 146, figs. 26–28.
Tapes textrix Sowerby, 1892, p. 59.

One valve, 32 × 17·5 mm., from black clay, East Cylinder, Grain Elevator, Durban (Geol. Survey), may be this species, or perhaps *undulata* (Born.)

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* ? a *laps. cal.* for *Venerupis rugosa*, or for *Petricola robusta*.

The differences are given by Prashad (1932, p. 241) but I have no material for comparison.

Recorded from Durban by Sowerby (1892).

Tapes deshayesii Hanley

Tapes deshayesii Hanley in Sowerby, 1852, p. 685, pl. 146, figs. 34–38; 1892, p. 59; Smith in Rogers, 1906c, p. 294.
Paphia deshayesii (Hanley), Haughton, 1932, p. 36.

Fossil: Pleistocene; Little Brak River, Mossel Bay (Smith in Rogers; also S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin); raised beach Knysna lagoon; Saldanha Bay (Haughton).

Port Elizabeth (Sowerby).

Remarks. South African specimens require re-examination.

Tapes malabarica (Chemn.)

Tapes malabarica (Chemn.), Sowerby, 1852, p. 682, pl. 145, figs. 6–8; Braga, 1952, p. 114, pl. 10, fig. 10; Franca, 1960, p. 96, pl. 27, fig. 6.
Pullastra malabarica (Chemn.), Chenu, 1862, fig. 413.
Tapes (*Protapes*) *malabarica* (Chemn.), Lynge, 1909, p. 237.
[?] *Tapes* sp. Etheridge, 1904, p. 82, pl. 1, fig. 9.
Paphia (*Protapes*) cf. *gallus* (Gmelin), Cox, 1939, p. 84, pl. 2, fig. 14.

Pallial sinus obliquely ascending towards umbo.

Fossil: Cretaceous, Zululand (Etheridge); Pliocene, Inhambane (Cox); Pleistocene, Dar-es-Salaam.

Durban harbour sediments (Dr. Lester King).

Distribution. Persian Gulf, Indian Seas, East Indies, China, Philippines.

Remarks. 'Venus gallus Spengler' is only a 'Museum' name and cannot be accepted (Lynge, p. 238).

Gen. DOSINIA Scop.

The present material, ranging from Lobito Bay around the coast to Delagoa Bay, is divisible into three lots on morphological characters, and presumably represents three species.

A Lobito Bay example was identified by Tomlin as *africana*, and Jaeckel was inclined to consider shells from the Agulhas Bank as also *africana*. Lamy reported *consobrina* from Walvis Bay, and followed Römer in making it a synonym of *subquadrata* Krss. Sowerby identified *Pieter Faure* shells as *lincta*; in 1892 he regarded *africana* as a variety of *lincta*, and *consobrina* as a variety of *hepatica*.

Smith reported *pubescens* from Natal, and *Pieter Faure* shells from Natal were identified also by Tomlin as *pubescens*.

For two of the lots I accept Tomlin's identifications, and for the third I follow Krauss.

Lunule deeply circumscribed	
Concentric lirae simple	*africana*
Concentric lirae anteriorly and posteriorly lamellose	*pubescens*
Lunule indistinct. Interior violaceous	*hepatica*

Unlike several other Venerids, *Dosinia* is a comparatively deep burrower, with long siphons. The shell lies in the sand with the ligament uppermost and parallel with the surface (Ansell, 1961, p. 512, fig. 15).

Dosinia africana (Gray)

Arthemis africana Gray, 1838, p. 309.
Dosinia africana (Gray), Dollfus, 1911, p. 52, pl. 3, figs. 19, 20; Dautzenberg, 1912, p. 91.
Dosinia consobrina Deshayes, 1853, p. 10; Lamy, 1931, p. 306.
Dosinia cretacea (*non* Rve.), Sowerby, 1899b, p. 157.
Dosinia lincta (*non* Pult.), Sowerby, 1892, p. 60; Wybergh, 1920, p. 66.
Dosinia pubescens (*non* Phil.), Gevers, 1932, p. 74.
Dosinia lupinus Linn. var. *afra* Gmelin, Nicklès, 1950, p. 201, fig. 381.

Lunules circumscribed by a deep groove which forms a distinct notch in the outline in front of the umbo. Concentric lirae simple; at 10 mm. alt. 3 lirae in a space of 1 mm. in middle of the valve. Buff or cream, no dark rays, not violaceous internally.

Up to length 52, alt. 50, thickness (valves together) 28 mm.

Fossil: Pleistocene; Cape Cross, South West Africa (Gevers); Bredasdorp Beds (Wybergh); Sedgefield near Knysna (A. R. H. Martin); Port Elizabeth (Johnson, 1904, *lincta*, but identification requires confirmation).

Walvis Bay (Lamy; also S. Afr. Mus.); False Bay and Mossel Bay (S. Afr. Mus.).

34° 8′ S., 24° 59′ E., 80 metres; 33° 50′ S., 25° 48′ E. (Jaeckel).

Saldanha Bay, 31 fathoms, several living; off Cape Point, 45 fathoms, several valves; False Bay, 32–45 fathoms, several living, and valves; off Struys Point, 48 fathoms, several living; off Cape St. Blaize, 36 fathoms, 2 living; off Gericke Point (Knysna area), 46 fathoms, 2 valves; Algoa Bay, 31–59 fathoms, several living, and valves (S. Afr. Mus. P.F. coll.).

Off Lamberts Bay (west coast) 30–92 fathoms; Lüderitzbucht, 35–160 metres (U.C.T.).

Distribution. Senegal; Mauritania to Ivory coast; mouth of Congo (Jaeckel); Lobito Bay (S. Afr. Mus. identified by Tomlin); Great Fish Bay, Angola (Jaeckel).

Remarks. The most easterly locality at which the *Pieter Faure* obtained specimens was False Island near the mouth of the Bushman River, 26° 40′ E.

The Saldanha Bay shells are often more or less corroded, like several other molluscs in that area.

I have examined the Cape Cross examples.

A single specimen from Algoa Bay (off Bird Island) 22 fathoms (S. Afr. Mus. No. 14959. P.F. coll.) is noticeably more compressed: 19·5 × 19 × 8 compared with other specimens, e.g. 18·5 × 17·5 × 10 mm.

Jaeckel recorded *orbignyi* Dnkr. from Great Fish Bay, Angola; Nicklès recorded the same species from Cameroon to Angola, and also *isocardia* Dnkr. from Mauritania to Angola, the latter species being ‘extrêmement variable de forme’.

Dosinia pubescens (Phil.)

Cytherea pubescens Philippi, 1847, p. 24, pl. 8, fig. 3.
Artemis pubescens (Phil.), Sowerby, 1852, p. 672, pl. 144, fig. 72.
Dosinia pubescens (Phil.), Smith, 1903a, p. 396; Prashad, 1932, p. 245 (references).
Dosinia japonica (*non* Rve.), Franca, 1960, p. 96, pl. 27, fig. 2.

Lunule circumscribed by a deep groove which forms a notch in the outline in front of the umbo. Concentric lirae simple in middle of shell but lamellose anteriorly and posteriorly, the escutcheon thereby clearly demarcated; at 10 mm. alt. 3(4) lirae in a space of 1 mm. in middle of valve.

Buff or pale fawn, or cream, without rays externally, or colouring internally.

Up to length 53 mm. (Franca); 28 × 28 × (one valve) 8 mm.

Delagoa Bay (Franca).

Off Tugela River, 40 fathoms, one valve; off Tongaat, 36 fathoms, 17 valves; off Umhloti River, 25 fathoms, 8 valves; off Cape Natal, 54 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Aden, Madagascar, Indo-Pacific.

Dosinia hepatica (Lam.)

Cytherea hepatica Lam., Krauss, 1848, p. 10.
Cytherea hepatica var. *subquadrata* Krauss, 1848, p. 10.
Dosinia hepatica (Lam.), Schwarz, 1900, p. 61; 1910, p. 116; ? Turton, 1932, p. 242; Braga, 1952, p. 112, pl. 10, fig. 7; Day & Morgans, 1956, p. 307; Macnae & Kalk, 1958, p. 129; Broekhuysen & Taylor, 1959, p. 292; Franca, 1960, p. 95, pl. 27, fig. 1 (bad photo).
[?] *Dosinia becki* Turton, 1932, p. 243, pl. 65, no. 1715.

Lunule shallow, circumscribed by a feebly impressed line which makes scarcely any indent in the outline in front of umbo. Concentric lirae simple; at 10 mm. alt. 5–6 in a space of 1 mm. in middle of valve.

Buff, more or less livid at umbones, often with radiating streaks but often unicolourous, internally violaceous.

Length 24·5, alt. 23·5, thickness (valves together) 12 mm.

Fossil: Post Pliocene; Inhambane (Cox, 1939); Pleistocene; Durban (Geol. Survey); Port Elizabeth (Schwarz); Knysna (Schwarz); Sedgefield near Knysna (A. R. H. Martin); Little Brak River, Mossel Bay (S. Afr. Mus.).

Knysna (Krauss; also U.C.T. *teste* Rehder); Still Bay (S. Afr. Mus. coll. Muir); Port Elizabeth (Sowerby; also S. Afr. Mus.); Port Alfred (Smith, Bartsch, Turton); Durban Bay (U.C.T.); St. Lucia Bay and Kosi Bay (U.C.T.); Delagoa Bay (Braga, Franca; also U.W.; also S. Afr. Mus. coll. K.H.B.); Beira (S. Afr. Mus.). Durban harbour sediments (Dr. Lester King).

Distribution. Red Sea, Mozambique, Madagascar.

Remarks. Krauss mentioned the external colour rays and the violet interior. Turton said bluish inside, and when fresh dark radiating streaks, but he also mentioned a 'notch in front of the umbone', which is in conflict with the present material.

The concentric lirae are finer than in the other two South African species.

Together with one shell externally livid and internally violaceous, I obtained at Delagoa Bay one completely white specimen. The Beira specimen in South African Museum is also white.

Venerupis macrophylla Desh.

Venerupis macrophylla Deshayes, 1855, p. 193, pl. 18, fig. 8; Sowerby, 1854, p. 763, pl. 165, fig. 20; Dautzenberg, 1929, p. 605; Prashad, 1932, p. 263 (references); Gravely, 1941, p. 52, fig. 20 *k*.
[?] *Venerupis rugosa* (*non* Desh.), Sowerby, 1892, pp. 59, 60.
[?] *Venerupis lajonkari* (*non* Payr.), Sowerby, 1897, p. 25.
Venerupis multicostata Turton, 1932, p. 245, pl. 66, no. 1731.
Saxicava sp. Day, Millard, Broekhuysen, 1954, p. 153.

Concentric lirae more or less lamellose, especially posteriorly; fine close-set radial pliculae. Internally brown or purplish-brown at hind end.

Length 29, alt. 21 mm. (Delagoa Bay); 24 × 13 mm. (St. Lucia Bay).

? Durban (Sowerby, as *lajonkari*); Port Alfred, dead valves (Turton); St. Lucia Bay, dead valves (U.C.T.); Delagoa Bay, 2 living (S. Afr. Mus. coll. K.H.B.).

Distribution. Madagascar, Madras, Indo-Pacific.

Remarks. The *Pieter Faure* specimens identified by Sowerby as *V. rugosa* are *Tapes corrugata*. Sowerby's other records of the Mediterranean *lajonkari* and the Californian *cordieri* are also probably misidentifications.

Clementia papyracea (Gray)

Clementia papyracea (Gray), Cox, 1927, p. 54, pl. 4, figs. 3, 4; Prashad, 1932, p. 262 (references).
Clementia mcclellandi Tomlin, 1921, p. 215, pl. 8, fig. 6.

With all respect to Tomlin, I must decline to include *C. mcclellandi* in the South African fauna-list. It is quite incredible that such a large shell should have remained undetected and unreported from Muizenberg or any other part of False Bay.

Shore collecting from early days, e.g. Andrew Smith (1825–1837), Baron von Ludwig (a resident of Cape Town), Wahlberg, Krauss, Fritsch (1863–1866), down to more recent times, e.g. South African Museum (coll. R. M. Lightfoot, W. F. Purcell, K.H.B.) and the University of Cape Town (Prof. Stephenson, Prof. Day and their assistants and students), has not produced a single specimen of this genus.

Dredging by Stimpson (1853, Simon's Bay), the *Challenger*, the *Valdivia*, the intensive work of the *Pieter Faure* and *Africana I* and *II*, has been equally unproductive.

In spite of its large size, 80 × 78 mm., I think that *mcclellandi* is only another synonym of *papyracea*, which is very variable (Cox). And in my opinion the valves seen by Tomlin had come from some other locality, not South African. McClelland (1864–1943) was a private collector who 'amassed a large world-wide collection'. In such cases, as is well known, the localities (if any) attached to the specimens are apt to be unreliable.

Fossil: Quaternary: Zanzibar; East Indies.

Recent: Arabian and Persian Gulf, Indo-Pacific.

References are here given as the species may possibly be found, fossil or living, on the east coast of Africa south of Zanzibar.

Fam. **Petricolidae**

For *Petricola ventricosa* Krauss see: *Gastrana abildgaardiana*, p. 550.

Petricola bicolor Sow.

Petricola bicolor Sowerby, 1854, p. 776, pl. 166, fig. 22.
Petricola typica (*non* Jonas), Sowerby, 1892, p. 60; 1897, p. 33; Turton, 1932, p. 246.
Petricola robusta (*non* Sow.), Sowerby, 1892, p. 61; Turton, 1932, p. 246.
Petricola ponsonbyi (*non* Sow.), Bartsch, 1915, p. 204.
Petricola albanyana Turton, 1932, p. 246, pl. 66, no. 1737.
Petricola sp. Turton, 1932, p. 246, pl. 66, no. 1734.

Radial ribs extending uninterruptedly from umbo to margin, but intersected by the concentric growth-lines; ribs coarser than in *ponsonbyi*, none of them bifurcate or divaricate, fine intermediaries may develop on the later part of the shells.

Drab, grey, brown, usually the hinder part darker brown both externally and internally, but more strongly so internally.

Up to 25 mm. (Turton). Examples of variation in shape: length 14, alt. 13, thickness (valves together) 9·5 mm., and 17 × 11 × 8 mm.

West coast: Walvis Bay; Lambert's Bay; Table Bay (S. Afr. Mus.); Milnerton, Table Bay (U.C.T.).

South coast: False Bay, Still Bay (S. Afr. Mus.); Port Alfred (Smith, Bartsch, Turton); Durban (Sowerby).

Remarks. Described originally from an unknown locality. Dr. Rehder of the U.S. National Museum suggested to Prof. Day (U.C.T.) that the South African shells formerly recorded under the names *typica* (West Indies) and *robusta* (Panama) should be identified as *bicolor*. It is quite likely that Hanley obtained the specimen, described by Sowerby, from the Cape. I adopt Dr. Rehder's suggestion.

It is possible that an abnormally elongate example of this species is responsible for Sowerby's record (1892) of *cultellus* from Port Elizabeth.

Petricola ponsonbyi Sow.

Petricola ponsonbyi Sowerby, 1892, p. 61, pl. 3, fig. 68; Turton, 1932, p. 246.
[Non] *Petricola ponsonbyi* Sow. Bartsch, 1915, p. 204 [= *bicolor*].

Fine radial riblets, later becoming stronger, those on the hinder part diverging from those on the middle part, the line of divergence running from umbo to postero-inferior corner of the shell.

White or cream, often with a faint lemon-yellow tinge, umbo pinkish.

Length 25, alt. 17 mm.; also 16 × 12, and 16 × 16 mm. (S. Afr. Mus.).

Port Elizabeth (Sowerby); Port Alfred (Turton); Still Bay (S. Afr. Mus. coll. Muir).

Remarks. Judging by the numerous valves collected by Dr. Muir this species is less liable to variation in shape, possibly owing to living in a more open habitat; distortion, however, does occur, as e.g. the circular valve mentioned above.

One Still Bay valve shows an abnormal sculpture: up to 8 × 5 mm. the fine pliculae, including the posterior bifurcate ones, are normal; on the later growth the pliculae are more spaced and their course is interrupted by growth-lines; a zone of about 2–3 mm. width in which they are straight and radial (curving slightly anteriorly) is followed by a zone in which they form a more or less zigzag sculpture.

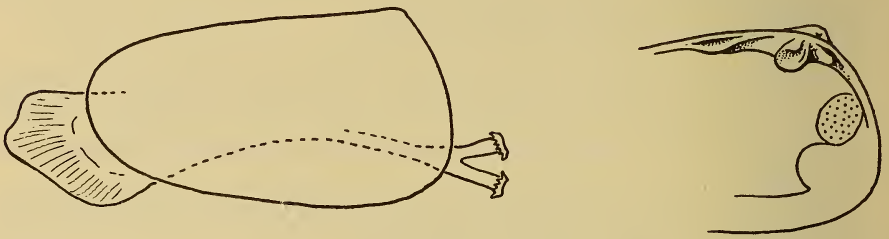

Fig. 28. *a*, *Donacilla africana* W. H. Turton, outline of shell (left valve) with projecting foot and siphons. *b*, *D. delagoae* n.sp., inner view of right valve.

Petricola (*Choristodon*) *divergens* (Gmelin)

Venus divaricata Chemnitz, 1788, p. 357, pl. 172, figs. 1666, 1667.
Venus divergens Gmelin, 1790, p. 3269.
Petricola divaricata (Chemn.), Sowerby, 1854, p. 776, pl. 166, figs. 24, 25.
Choristodon divaricata (Chemn.), H. & A. Adams, 1857, p. 442, pl. 110, figs. 2, 2*a*; Chenu, 1862, fig. 453.
Petricola divergens (Gmelin), Prashad, 1932, p. 264 (references).

Radial pliculae forming longitudinal series of zigzags; posteriorly 8–9 radial lamellose ribs.

Length 22·5, alt. 18, thickness (valves together) 15 mm.; also 21 × 18 × 15 mm.

Delagoa Bay, two living (S. Afr. Mus. A9542. coll. K.H.B.).

Distribution. Red Sea, Persian Gulf, Mauritius, Indo-Pacific.

Remarks. In having radial lamellose ribs on the hinder part these shells resemble Sowerby's figure of *lapicida* Chemn. (1854, pl. 166, fig. 26).

Fam. **Mesodesmatidae**

Donacilla africana W. H. Turton

Fig. 28 *a*

Donacilla africana Turton, 1932, p. 252, pl. 68, no. 1782.

Donaciform, very inequilateral, strongly produced anteriorly, umbones near posterior end (not anterior as in Turton), surface sculpture of growth-lines only. No pallial sinus (cf. Turton's photo).

Foot very large, more or less triangular; siphons distally separate, apices papillose.

White. Length 7·5, alt. 4 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Port Alfred (Turton); Still Bay (S. Afr. Mus. coll. Muir); Breede River mouth, and Great Brak River mouth (U.C.T.).

Inhambane, living (U.C.T.).

Types in S. African Museum (A 29742), cotypes in Witwatersrand University.

Remarks. Very common at Still Bay. I can find no differences in the Inhambane examples.

Donacilla delagoae n.sp.

Fig. 28 *b*

Externally very similar to *africana*, but not so strongly produced anteriorly. A small semicircular pallial sinus, approximately equal in size to the posterior adductor scar. Foot and siphons as in *africana*. White. Length 6, alt. 3·5 mm.

Inhaca Island, Delagoa Bay, living (U.W.).

Remarks. It is curious to find a different species at Delagoa Bay, while the South African *africana* extends farther northwards to Inhambane. The pallial sinus, however, is distinctive.

Gen. ERVILIA Turton 1822

Smith (1906b, p. 66) accepted Sowerby's identification (1904, p. 15) of shells from the Buffalo River (East London) as *Ervilia* ? *purpurea* Desh. *ined.* The former's description and figure (pl. 8, figs. 10, 11), however, were based on Red Sea examples in the British Museum. He regarded *purpurea* as the same as *scaliola* Issel.

The Buffalo River specimens returned by Sowerby with his label are not *Ervilia*, but *Psammotellina capensis.*

Smith had previously (1903a, p. 399) recorded from Durban the Japanese and Siamese species *Ervilia bisculpta* Gould (Lynge, 1909, p. 219, pl. 4, figs. 14–16).

Nevertheless until confirmation is forthcoming, it is better to exclude the genus *Ervilia* from the South African fauna list.

Fam. **Mactridae**

Lamy, 1917/18, pp. 173–411, pls. 6, 7.

Gen. MACTRA Linn.

In the case of isolated specimens coming into the hands of specialists, minor differences tend to acquire the status of *specific* characters. About a dozen names of *Mactra* 'species' appear in the South African fauna-list, but only five species seem to be actually inhabitants of South African waters, or six if *Schizodesma* be included. *M. laevis* Dnkr. (1871, p. 171) from Mossel Bay (Lamy, p. 188, footnote 2) seems to have been overlooked by Sowerby, Smith, and Tomlin, compilers of the 'official' list.

Tomlin (1923, p. 52) introduced *rochebrunei* Lamy (*hians* Phil., non Pulteney, Wood) into the list, based on Natal specimens sent to Lamy by Burnup. But Lamy (l.c., p. 215) mentioned no such specimens; and he gave Zanzibar as the nearest locality to South Africa for this species. Burnup did, however, send to Lamy examples of *aequisulcata* (p. 211) and *intuspicta* (p. 229). *M. rochebrunei* is here excluded from the fauna-list.

I. Umbones close together.
  A. Ventral lamella of anterior lateral tooth in right valve entire (*Mactra* s.s.)
    1. Concentric sulci over whole shell. Tumid .. .. *aequisulcata*
    2. Concentric sulci dorsally on each side of umbo, and also on anterior half in shells larger than *c.* 25 mm. long .. .. *lilacea*
    3. Concentric sulci on each side of umbo only.
      (*a*) Oval-triangular, compressed. Cream or fawn .. .. .. *glabrata*
      (*b*) Subtriangular, tumid. Violaceous, especially internally .. .. *cuneata*
  B. Ventral lamella of anterior lateral tooth in right valve bilobed (*Mactrotoma*). A distinct ridge from umbo to postero-ventral corner. No sulci on any part of shell .. .. *ovalina*
II. Umbones far apart. Ligament in a deep curved groove. Lateral teeth granulate (*Schizodesma*) .. .. *spengleri*

Mactra aequisulcata Sow.

Mactra aequisulcata Sowerby, 1894, p. 376; 1897, p. 21, pl. 8, fig. 26; Lamy, 1917, p. 211; Braga 1952, p. 116, pl. xi, fig. 2; Macnae & Kalk, 1958, p. 129.

Tumid. Regular concentric sulci over whole shell. In large shells the median part near the umbo becomes worn more or less smooth.

Fawn or yellowish-brown, uniform.

Length 66, alt. 53 mm.; 54 × 44 × (valves together) 31 mm.

Durban (Sowerby); Tongaat (Lamy; coll. Burnup); Delagoa Bay (Braga; also U.W.); Chinde, low-tide, living (S. Afr. Mus. coll. K.H.B.); Bazarute Island (U.W.).

Off Amatikulu River (Zululand), 26 fathoms, 4 living (S. Afr. Mus. P.F. coll.).

Distribution. Madagascar.

Mactra lilacea Lam.

Mactra lilacea Lamarck, 1818, p. 479; Lamy, 1917, p. 203, pl. 6, fig. 6; Franca, 1960, p. 97, pl. 28, fig. 3.
Mactra decora Reeve, 1854, sp. 80; Deshayes, 1855, p. 63.
Mactra adansoni (*non* Linn.), Sowerby, 1892, p. 55.
Mactra adansoni var. *semistriata* Turton, 1932, p. 255.
Mactra intuspicta (*non* Desh.), Lamy, 1917, p. 229; Tomlin, 1923, p. 51.
[?] *Mactra glabrata* (*non* Linn.), Braga, 1952, p. 115 (= juv.); Macnae & Kalk, 1958, p. 129.
Mactra semisulcata Braga, 1952, p. 116, pl. xi, fig. 4.

Oval. Concentric sulci on each side of umbo, but no sulci elsewhere until the shell reaches a length of 25–35 mm., when they begin to appear on the anterior half.

Length 68, alt. 47 mm.

Delagoa Bay (Braga, Franca; also S. Afr. Mus. coll. K.H.B.); Inhambane (Braga; also S. Afr. Mus. coll. Ross-Frames).

Distribution. Red Sea; Karachi (Melvill & Standen as *glabrata* ? *non* Linn., *apud* Lamy); Nossi Bé (U.W.); Madagascar.

Remarks. Sowerby (1889, p. 156) came to the conclusion that *adamsoni* [*sic*] and *decora* were conspecific. But Lamy (p. 197 and p. 206 footnote) suggested that Port Elizabeth specimens identified by Sowerby as *adansoni* were really *lilacea*; Lamy on both pages erroneously added to the reference to Sowerby a reference to the figure of *Crassatella acuminata* Sow. I think it very unlikely that the Port Elizabeth shells, if they really came from that locality, were *lilacea*; they were probably *adansoni* (*glabrata*); and Sowerby erred in regarding *adansoni* and *decora* as conspecific.

Lamy made *semisulcata* a synonym of *olorina* Phil. 1846, another Red Sea species which also has the concentric sulci confined to the anterior end of the shell.

Mactra glabrata Linn.

Mactra adansonii Philippi, 1849, p. 152; Sowerby, 1889, p. 156 (*adamsoni* [*sic*]); Schwarz, 1910, p. 115; Bartsch, 1915, p. 209; Turton, 1932, p. 255.*; Day, 1959, p. 539.
Mactra adansoni var. *decora* (*non* Desh.), Turton, 1932, p. 255.
Mactra adansoni var. *elongata* Turton, 1932, p. 255, pl. 69, no. 1804.
Mactra laevis Dunker, 1871, p. 171.
Mactra glabrata Linn., Sowerby, 1897, p. 32 (? = *decora* = *lilacea*); Smith in Rogers, 1906c, p. 294; Lamy, 1917, p. 195 (references); Jaeckel, 1931, p. 240; Turton, 1932, p. 256; Nicklès, 1950, p. 208, fig. 395.
[Non] Braga, 1952, p. 115 [= *lilacea* juv.].
Macnae & Kalk, 1958, p. 129 [? = *lilacea*].

Concentric sulci on each side of umbo, but not elsewhere. Cream or fawn, uniform or with faint radial streaks.

Length 100, alt. 73 mm.; 82 × 57 × (valves together) 42 mm., and 52 × 42 × 23 mm. Juveniles tend to be proportionately a little less high: compare 52 × 42 and 23 × 17 mm.

Fossil: Pleistocene; Little Brak River, Mossel Bay (Smith in Rogers); Sedgefield near Knysna (A. R. H. Martin); Port Elizabeth (Johnson, Schwarz); Durban (Geol. Survey).

Mossel Bay (Dunker); Port Elizabeth (Sowerby); Algoa Bay (Jaeckel); Port Alfred (Bartsch, Turton); Durban (Sowerby).

False Bay, Hermanus, Still Bay, Sebastian Bay, Mossel Bay, Algoa Bay (S. Afr. Mus.).

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* Turton is slightly in error. Lamy in his monograph 1917 (not 1923) did not 'say doubtfully that it [*adansoni*] is the same as *lilacea*'. Lamy considered that *Sowerby's Port Elizabeth* 'adansoni' was probably *lilacea*. It is now impossible to say what Sowerby's shells were, but at a guess they were probably *adansoni* (*glabrata*).

False Bay, 9 fathoms, one living; off Cape Infanta, 40 fathoms, one valve; off Umkomaas (Natal), 40 fathoms, one valve; off Cape Natal (Durban), 54 fathoms, 6 valves; off Morewood Cove (north of Durban), 27 fathoms, several valves; off Amatikulu River (Zululand), 26 fathoms, 12 living (S. Afr. Mus. P.F. coll.).

Saldanha Bay, and False Bay (U.C.T.).

Distribution. Cape Blanco to Angola (Nicklès).

Remarks. None of the Natal and Zululand specimens exceed 25 mm. in length. They appear indistinguishable from Cape and Agulhas Bank specimens. If they are conspecific, the occurrence off the Zululand coast lends credence to the Delagoa Bay (U.W.) and Inhambane (Braga) records; and also to the Karachi record (Melvill & Standen) which Lamy doubted (p. 197 footnote 3) and assigned probably (p. 206, footnote 1) to *lilacea*.

In separating *glabrata* and *lilacea* size must be taken into account, because the concentric sulci on the anterior end of the latter are not present in juveniles (p. 517 *supra*). Juveniles (under 25 mm. long) of the two species are impossible to separate.

M. largillierti Phil. from Gaboon and Angola (Lamy, 1917, p. 198; Nicklès, 1950, p. 208, fig. 396; Franca, 1957, p. 5) is said to be distinguished by a more transversely oval shape.

Mactra cuneata (Chemn.) Gmelin

Mactra australis (*non* Lam.), Krauss, 1848, p. 1.
Mactra cuneata Lamy, 1917, p. 229 (references).
Mactra intuspicta (*non* Desh.), Lamy, 1917, p. 229; Tomlin, 1923, p. 51.
Mactra lurida Braga, 1952, p. 116, pl. xi, fig. 3; Franca, 1960, p. 98, pl. 28, fig. 4.

Tumid, subtrigonal, postero-dorsal margin straight (seen from inside). Concentric sulci on each side of umbo, but not elsewhere. In right valve the anterior branch of the Λ-shaped cardinal tooth is in the same line with the *dorsal* lamella of the anterior lateral tooth.

Greyish-violaceous, paler towards umbo, sometimes faintly radiately streaked, internally violet.

Length 32, alt. 25 mm.; 28·5 × 22 × (valves together) 18 mm.

Natal (Krauss); Durban (Lamy; Tomlin); Delagoa Bay (Braga, Franca; also S. Afr. Mus. coll. K.H.B. living); Inhambane (U.C.T.).

Distribution. Ceylon; East Indies.

Remarks. Obviously the Durban specimens identified by Tomlin and Lamy as *intuspicta*, and Braga's specimens identified as *lurida*, are one and the same species.

Krauss also had the same species, as shown by the description and colour which he gave. But he was incorrect in giving the Cape (in addition to Natal) as a locality.

Mactra (*Mactrotoma*) *ovalina* Lam.

Mactra capensis Sowerby, 1892, p. 55, pl. 3, fig. 72; Johnson, 1904, p. 11; Jaeckel, 1931, p. 241; Turton, 1932, p. 255; Macnae & Kalk, 1958, p. 129.

Mactrinula ovalina (Lam.), Sowerby, 1897, p. 22; Schwarz, 1900, p. 61.
Mactra ovalina Lam., Smith, 1904a, p. 25; Turton, 1932, p. 255.
Mactra alfredensis Bartsch, 1915, p. 209, pl. 44, figs. 6, 7; Turton, 1932, p. 255.
Mactra depressa Spengler (*non* Lam.), Lamy, 1917, p. 253, pl. 6, fig. 1 (references).
Mactra fragilis (*non* Chemn.), Franca, 1960, p. 97, pl. 28, fig. 2.

Oval, compressed, thin; a distinct ridge from umbo to postero-ventral corner, dorsal to the ridge one or two feeble radial ribs and surface irregularly rugulose; no concentric sulci anywhere, but fine concentric growth-lines over whole shell, with a few stronger ones on anterior side of umbo.

Cream or pale fawn, covered with a thin pale yellowish periostracum, thicker and somewhat fibrous or wrinkly on the postero-dorsal area.

Length 39, alt. 29 mm.; 25·5 × 19 × (valves together) 9·5 mm.

Fossil: Pleistocene; Port Elizabeth (Johnson); Knysna (Schwarz); Sedgefield near Knysna (A. R. H. Martin).

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Durban (Sowerby); Delagoa Bay (Franca).

False Bay, 22–47 fathoms, 4 living, one valve; off Cape St. Blaize, 37–42 fathoms, one living, one valve; off Nanquas Peak (eastern end of Algoa Bay), 49 fathoms, 4 valves; off East London, 32–43 fathoms, 2 living, 6 valves (S. Afr. Mus. P.F. coll.).

False Bay (U.C.T.); Inhambane (U.C.T.).

Distribution. Zanzibar; Indo-Pacific.

Remarks. M. capensis was mentioned by Lamy only in two footnotes (pp. 188, 190), where he suggested that it is very near to *corallina* Linn. var. *stultorum* Linn. Sowerby also said (1892) that his *capensis* 'somewhat resembled' *stultorum*. Both statements are curious, because Sowerby's figure bears no resemblance to *stultorum*. On the contrary, Lamy's pl. 6, fig. 7, of Lamarck's *brasiliana* (= *fragilis* Chemn.) bears a very close resemblance to Sowerby's figure.

Evidently the Indo-Pacific *ovalina* is very similar to the Atlantic *fragilis*. Maybe they cannot be distinguished, and thus form a parallel with *glabrata* which has been recorded from both the west and east coasts of Africa, with South Africa as a connecting link.

In this subgenus the anterior cardinal tooth in both valves has an accessory lamella; in the right valve the cardinal, accessory lamella, and the anterior lateral are in the same straight line (or very nearly so) and together form a trilobed lamella; in the left valve the accessory lamella and the lateral form a bilobed lamella, not quite in line with the anterior cardinal (cf. Lamy. loc. cit., figs. p. 179).

Schizodesma spengleri (Linn.)*

Mactra spengleri Linn.; von Martens, 1874, p. 122.
Schizodesma spengleri (Linn.), Newton, 1913, p. 342, pl. 22, figs. 1–3; Barnard, 1962b, p. 186.
Spisula (*Schizodesma*) *spengleri* (Linn.), Lamy, 1918, p. 328, fig. on p. 295.
Mactra (*Schizodesma*) sp. Turton, 1932, p. 256, pl. 69, no. 1815.

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* Sherborn, *Index Anim.*, 1758–1800, p. 916: *sprengleri* [*sic*]; also *Curculio sprengleri*. The 12th edition of Linne is not available here for checking the original spelling; but *sprengleri* seems to be an obvious misprint.

Very young shells are relatively higher than larger shells: length 1·5, alt. 1·25 mm., and 1·75 × 1·5 mm. The ridge from umbo to postero-ventral corner distinct, postero-dorsal margin convex.

The figure of *rufanensis* Turton (1932, pl. 69, no. 1805), 4 × 3·5 mm., shows a similar convex postero-dorsal margin, but not an angular postero-lateral corner, and Turton made no mention of a ridge from the umbo to this corner. Nevertheless *rufanensis* may prove to be merely a juvenile *spengleri*.

Up to length 113, alt. 80 mm.; 94 × 68 × (valves together) 45 mm.

Fossil: Pleistocene, Port Elizabeth. The reported occurrence (Krige, A. V., 1927) in a raised beach at Velddrif, Berg River (west coast) is not acceptable unless confirmed.

Common in False Bay; recorded also from Port Elizabeth (von Martens) and Port Alfred (Bartsch, Turton); Still Bay (S. Afr. Mus. coll. Muir).

Remarks. According to von Martens this is the type species of Linnaeus's genus *Mactra*, but apparently nowadays *corallina-stultorum* is regarded as the genotype (Lamy 1917, Stewart 1930, Prashad 1932).

The deep ligament-pit, widely separated umbones, and granulate lateral teeth seem sufficient to characterize a genus separate from either *Mactra* or *Spisula*.

Gen. LUTRARIA Lam.

Holme, 1959, pp. 557–568, 2 pls. & text-figs.

Specimens of *Lutraria* have been recorded from South Africa under three names: *capensis* Rve. (or *lutraria* var. *capensis*), *intermedia* Sow. 1859 (*non* Deshayes 1854), and *oblonga* (Chemn. Gmelin).

Only a small number of local specimens is available for study, and no European species for comparison. They appear separable into three living species, and one fossil species.

1. Dorsal margin sharply cristate, external surface not visible in internal view. Ante-umbonal length 1½ (juv.)—2 in post-umbonal length.
    (*a*) Altitude slightly less than 2 (juv. 20 mm. long) to 2 (adult) in length. Posterior dorsal margin convex .. .. *lutraria*
    (*b*) Altitude 2¼ in length. Posterior dorsal margin straight .. .. .. ? *oblonga*
2. Dorsal margin not cristate, concave on either side of umbo, external striated surface visible in interior view.
    (*a*) Ante-umbonal length 1⅚ in post-umbonal length. Altitude 1⅝ in length. Posterior dorsal margin convex .. .. *angustior*
    (*b*) Ante-umbonal length 1¾ in post-umbonal length. Altitude 2½ in length. Posterior dorsal margin straight .. .. † sp.

I have seen no specimens of the two following species, and do not know whether they fall into the first or the second major group of the above conspectus.

(*a*) Ante-umbonal length 2½ in post-umbonal length. Altitude 2¼ in length. Posterior dorsal margin straight (or slightly concave) (H. & A. Adams, pl. 101, fig. 5) .. .. *oblonga*
(*b*) Ante-umbonal length 1¾ in post-umbonal length. Altitude 2½ in length. Posterior dorsal margin straight (or slightly convex). Hind end acuminate. (Nicklès, 1950, fig. 404) .. .. *elongata*

Lutraria lutraria (Linn.)

Fig. 29 *a*, *b*

Lutraria elliptica Lamark, 1801, p. 120; Turton, 1932, p. 256.
Lutraria elliptica var. *intermedia* (*non* Desh.), Sowerby, 1859, pl. 4, fig. 1; 1892, p. 56.
Lutraria capensis Desh. MS. Reeve, 1854, pl. 3, fig. 9; Sowerby, 1889b, p. 156; 1892, p. 56; Bartsch, 1915, p. 210; Lamy, 1918, p. 306; Turton, 1932, p. 256; ? Haughton, 1932, p. 38.
Lutraria lutraria (Linn.), Lamy, 1918, p. 363, fig. on p. 360 (hinge) (references); Nicklès, 1950, p. 211, fig. 403; Holme, 1959, p. 560, pl. 2, figs. 1–3, text-figs. 1*a*, 2*a*, 3*a*, 4 *a*, *c*; Barnard, 1962b, p. 186.
Lutraria albanyana Turton, 1932, p. 256, pl. 69, no. 1815.
[Non] *Lutraria capensis* Smith in Rogers, 1906 [= fossil species (*v. infra*)].

Anterior and posterior dorsal margins raised into a thin sharp crest, forming when viewed internally the dorsal outline of the shell, slightly concave below the umbo and gently convex on each side. Near the posterior dorsal margin fine radial puckerings, usually best seen when the periostracum is intact. Anterior and posterior lateral teeth in left valve present but weak, in right valve the anterior lateral combined with the anterior branch of the cardinal to form a bilobed lamella; posterior lateral weak. Scar of lower border of pallial sinus running close to the pallial line, but not confluent with it except distally where they form a slightly enlarged oval scar.

White with olivaceous brown periostracum.

Length 143, alt. 75 mm.; also 120 × 63, 118 × 66, 116 × 60, 106 × 59, 100 × 59, 97 × 54·5, 78 × 41, 37 × 18·5, 24·5 × 12·5 mm.; also 116 × 75 mm., but the growth-lines more normal in its younger stages, e.g. 94 × 54 and 60 × 30 mm.

A slightly malformed specimen from Table Bay (S. Afr. Mus. No. 5568 *bis*), ventral margin nearly straight, posterior margin very bluntly rounded, especially in the smaller valve; left valve 68 × 36, right valve 71 × 38 mm.

Fossil: Pleistocene, Bogenfels and Angra Juntas, South West Africa (Haughton); Langebaan, Saldanha Bay (Haughton).

Table Bay, False Bay, Hermanus (Walker Bay), Still Bay (S. Afr. Mus.); Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton).

False Bay, 10 fathoms, 4 valves (labelled by Sowerby; *intermedia*); Algoa Bay, 49 fathoms, one juv. valve; off Umhloti River (Natal), 27 fathoms, 5 juv. valves (broken, hinge-line only present) (S. Afr. Mus. P.F. coll.).

False Bay, Saldanha Bay, and Lüderitzbucht (U.C.T.).

Distribution. Mediterranean and Atlantic coast of Europe. ? West Africa and Senegal.

Remarks. The thin crest-like dorsal edge is easily worn away in beach examples; in which case sometimes the growth-lines on the external surface, especially anteriorly, become partly visible in internal view.

L. capensis is said to differ from typical *lutraria* by having the altitude a little more than half the length (Lamy, p. 368; also Reeve's figure).

Lutraria ? *oblonga* (Chemn. Gmelin)

Fig. 29 *a*

Lutraria oblonga (Chemn., Gmelin), Sowerby, 1889b, p. 155; 1892, p. 56; 1897, p. 32; Lamy, 1918, p. 370, fig. on p. 361 (hinge) (references).
Lutraria oblonga var. *australis* Lamy, 1918, p. 370.

Dorsal margin cristate as in *lutraria*, but postero-dorsal margin straight, not convex. Altitude $2\text{–}2\frac{1}{5}$ ($2\frac{1}{4}$) in length. Hinge teeth and pallial sinus as in *lutraria*.

White with grey-brown periostracum.

Length 112, alt. 56 mm.; also 105 × 48, 85 × 39, 84 × 37, 60 × 27 mm.

Off Tugela River (Natal), 37 fathoms, one (bivalve, but periostracum abraded) and 2 valves (S. Afr. Mus. P.F. coll.).

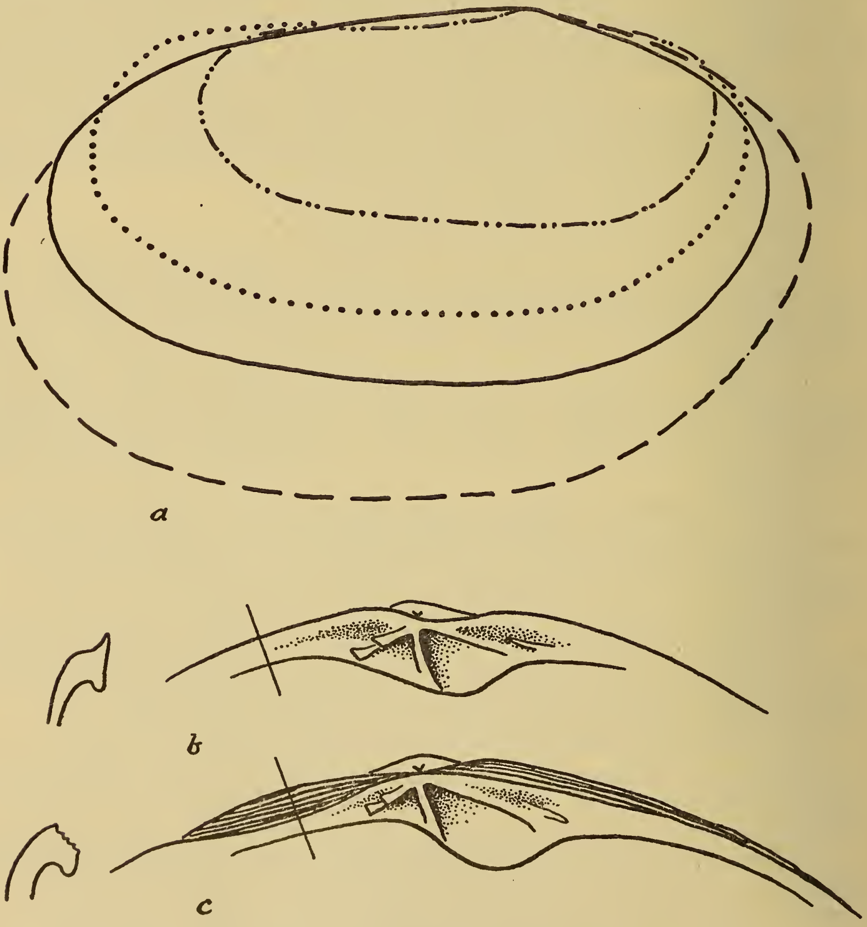

Fig. 29. *a*, Outlines of *Lutraria*: —— *lutraria*, Table Bay, — — — *angustior*, Table Bay, ... ? oblonga, Knysna, —··—··— †Little Brak River, raised beach. *b*, *c*, hinge of right valve of *L. lutraria* (Linn.) and *angustior* Phil., with sections.

Durban harbour sediments (Dr. Lester King).

Knysna, living (Prof. Day, U.C.T. 1960).

Remarks. These specimens are probably the same as those recorded as *oblonga* by Johnson from Port Elizabeth, and by Sowerby from Port Elizabeth and Natal. Lamy recorded var. *australis* from Zanzibar. Cox (1939) identified specimens from the Miocene of Mozambique as cf. *philippinarum* Rve.

In the right valve the anterior branch of the cardinal tooth forms with the anterior lateral a bilobed lamella (as in *lutraria*, *supra*); not a bifid tooth as in Lamy's figure of *oblonga*; nor does the anterior lateral in the left valve approach and simulate a second cardinal tooth.

Therefore the name *oblonga* is here used only *pro tem*, pending further investigation.

Lutraria angustior Phil.

Fig. 29 *a*, *c*

[?] *Lutraria senegalensis* Gray, 1837, p. 374, fig. 32.
Lutraria elliptica var. *angustior* Philippi, 1844, p. 7.
Lutraria lutraria var. *angustior* (Phil.), Lamy, 1918, p. 365 (references).
Lutraria angustior Holme, 1959, p. 557, pl. 1, pl. 2, fig. 4. text-figs. 1*b*, 2*b*, 3*b*, 4*b*.

Shell thicker than equal-sized *lutraria*. Anterior and posterior dorsal margins not raised, nor forming a sharp edge; outline viewed internally concave on both sides of umbo, especially anteriorly, revealing the striated external surface. Hinge teeth as in *lutraria*.

There is one specimen in South African Museum from Table Bay (S. Afr. Mus. No. 5568), 130 × 80 mm., which accords with Holme's description (perhaps not very clearly expressed on p. 559) of the dorsal outline. But the lower border of the pallial sinus runs parallel for its whole length with the pallial line, the two uniting only distally to form an oval scar. Also the fine radial puckerings on the posterior dorsal surface are present (as in *lutraria*).

Lamy regarded *angustior* as a variety of *lutraria*, separated merely by differences in size and shape. Holme, however, gave reasons for regarding *angustior* as a distinct species. Some of the characters he relied upon seem to be somewhat variable, as he himself admitted, and as is shown by the present specimen. But the dorsal outline is a clear-cut character which may prove of specific value.

In the present specimen the striated dorsal surfaces in front of and behind the umbones form, when the valves together are viewed dorsally, a sort of pesudo-lunule and (less marked) a pseudo-escutcheon.

L. angustior has been recorded from the Mediterranean and west coast of Europe. Lamy considered that specimens from Senegal were very close to *angustior*. Further research may show that Philippi's name should give place to Gray's *senegalensis*.

U.C.T. has a specimen from Langebaan (Saldanha Bay).

† *Lutraria* sp.

Fig. 29 *a*

Lutraria capensis (narrow form) Smith in Rogers, 1906c, p. 294.

Smith recorded a narrow form of *capensis* from a raised beach at Little Brak River, Mossel Bay. From this deposit South African Museum has one (bivalve) specimen. It measures 83 × 34 mm.; the ante-umbonal length is 29 mm., which is thus not quite twice in the post-umbonal length. Neither the anterior nor the posterior dorsal margins are raised enough to conceal *entirely* the growth-lines on either side of the umbo, and the posterior outline shows a distinct downward bend just beyond the posterior lateral tooth. The posterior dorsal margin is straight or very slightly concave. The hinge-teeth are as in *lutraria* (*supra*). The lower border of the pallial sinus is confluent with the pallial line for at least three-quarters of the length of the sinus.

This specimen would seem to be a narrow form of *angustior* rather than of *lutraria-capensis*. But more material is desirable.

Another specimen, 115 × 57 mm., has the cristate dorsal margin and slightly convex postero-dorsal margin of *lutraria*, but is slightly narrower and has not the typical oval shape with convex lower margin.

The hinge of a right valve was found by Dr. A. R. H. Martin in the deposit at Sedgefield near Knysna, with cristate dorsal margin, and presumably belonging to a shell similar in shape to the last mentioned Little Brak River shell.

Lutraria elongata Gray

Lutraria elongata Gray, Lamy, 1918, p. 369; Nicklès, 1950, p. 211, fig. 404; Franca, 1957, p. 6.

Lamy considered this species to be well characterized by its shape: anteriorly bluntly rounded, posteriorly elongate and *acuminate* (see Nicklès's figure). Shape alone is inadequate to define a species, and further details are required for a diagnosis.

Lobito Bay (Lamy); French Congo to Angola (Nicklès); Angola (Franca).

Standella nicobarica (Gmelin)

Mactra nicobarica Gmelin, 1790, p. 3261.
Mactra aegyptiaca Chemnitz, 1795, p. 218, pl. 200, figs. 1955, 1956.
Standella aegyptiaca (Chemn.), Smith, 1910, p. 214.
Standella (*Eastonia*) *nicobarica* (Gmel.), Lamy, 1918, p. 389; Dautzenberg, 1929, p. 617.
Eastonia nicobarica (Gmel.), Macnae & Kalk, 1958, p. 129.
Standella rugosa (*non* Helbling), Franca, 1960, p. 98, pl. 28, fig. 5.

Numerous fine radial ribs, nearly equidistant and equal in size, from anterior end to a line from umbo to middle of posterior margin; dorsal to this line finer and closer-set, somewhat undulate pliculae diverge towards the postero-dorsal margin.

Length 54, alt. 37 mm.

Siphons completely united, enclosed in a brown epidermis, 1½–2 times the length of the shell, nonretractile.

Fossil: Pleistocene; Congella (Durban) 6 feet below original floor (Geol. Survey).

Congella (Durban) (Smith); Delagoa Bay (U.W. living; also S. Afr. Mus. coll. K.H.B. living; also Franca); Inhambane (U.C.T.).

Distribution. Aden, Djibouti, Muscat, Zanzibar, Madagascar, Australia.

Remarks. Although Lamy placed this species in the subgen. *Eastonia*, the present specimens have the hinge-teeth as in Lamy's figure (p. 382) of *Standella pellucida*, not as in his figure (p. 383) of *Eastonia rugosa*, i.e. the two branches of the Λ tooth in the left valve diverge at *circa* 90°.

Externally this species somewhat resembles *Tapes bruguieri* (*Veneridae*) as figured by Gravely (1941, fig. 20 *o*) but the latter has no fine divaricating pliculae posteriorly. Also similar is *Asaphis deflorata* (Linn.) (*Psammobiidae*).

Standella (*Eastonia*) *solanderi* (Gray)

Spisula solanderi Gray, 1837, p. 373.
Standella solandri [*sic*] (Gray), Sowerby, 1892, p. 56; Smith, 1904a, p. 25.
Eastonia africana Bartsch, 1915, p. 209, pl. 43, figs. 5, 6; Turton, 1932, p. 256.
Standella (*Eastonia*) *solanderi* (Gray), Lamy, 1918, p. 391; Dautzenberg, 1929, p. 617; Haas, 1936, p. 147, fig. 12; van Bruggen, 1952, p. 17, pl. 1, figs. 2, 3.

Numerous radial ribs, none of them coarse, but varying in size and distance apart, from anterior end to a line from umbo to postero-ventral corner, the hinder ribs more or less cristate, especially the last one; dorsal to the last rib the surface with concentric growth-lines only.

Length 36, alt. 30 mm.

Dead valves: Jeffreys Bay (van Bruggen); Port Alfred (Smith, Bartsch, Turton); Durban (van Bruggen).

Distribution. Red Sea, east coast of Africa, Madagascar.

Remarks. The shape varies, and distorted specimens living in corals may occur, e.g. 'Petricola lyra' Melvill (1898, p. 204, pl. 12, fig. 13) which Melvill later (1899, p. 97) recognized as *S. solanderi*. H. C. & R. Winckworth (1935, p. 162) found *Eastonia rugosa* burrowing in limestone near low-water on the Portuguese coast, together with *Pholas* and *Barnea*. Presumably *nicobarica* and *solanderi* have a similar habitat.

The Λ-shaped cardinal tooth in the left valve is compressed, the branches diverging at *c.* 45°, but the anterior lateral tooth in all the present specimens is oblique, not nearly vertical as in Lamy's figure (p. 383) of *Eastonia rugosa*.

Fam. **Donacidae**

The locality 'Cape of Good Hope' for *scortum* Linn. given on the explanation to pl. 280, figs. 1–3, of Sowerby's *Thesaurus*, cannot be taken seriously.

The occurrence of the West African *elongatus* and *owenii* on the South African coast, as reported by Sowerby 1892, and the latter also by Johnson 1904, seems unlikely; and the record of *lubricus* Hanley (? = *bicolor* Lam., = *cuneata* Linn.) needs confirmation.

Pilsbry (1901) not only described a new species but recorded four other species of *Donax* all from 'ballast from South Africa'. As Smith said (1906b, p. 65), this is a 'rather unsatisfactory locality'. Two of the species recorded, however, are known South African (Natalian) species; thus the other two: *erythraeensis* Bertin and *spiculum* Rve. may also eventually be found living in South African waters.

Lamy (1931) recorded *D. incertus* Bertin 1882 from both Walvis Bay and Beira.

Donax serra (Chemn.) Bolten

Donax serra (Chemn.) Bolt., Krauss, 1848, p. 5; Jaeckel, 1931, p. 239; Lamy, 1931, p. 306; Turton, 1932, p. 253.
Donax serra var. *aurantiaca* Krauss, 1848, p. 6; Turton, 1932, p. 253.
Donax ringens Chenu, 1862, fig. 316 (not good).
Donax ? *helena* Turton, 1932, p. 254, pl. 69, no. 1791 (= juv.).

Fossil: Pleistocene, Angras Juntas, Oranjemund (South West Africa), Alexander Bay (Haughton); Sedgefield (A. R. H. Martin).

Table Bay, and False Bay to Port Alfred (auct. and S. Afr. Mus.), Durban, juv. (S. Afr. Mus. coll. T. D. Butler, Museum taxidermist, 1894).
Saldanha Bay; and Klein River estuary, Hermanus (U.C.T.); Walvis Bay (Lamy).

The var. *aurantiaca* Krss. has been recorded from Mossel Bay and Port Alfred. I have seen specimens from Muizenberg (False Bay).

Donax sordidus Hanley

Donax sordidus Hanley, 1845, p. 15; Krauss, 1848, p. 6, pl. 1, fig. 4; Reeve, 1855, *Donax*, pl. 5, fig. 32; Sowerby, 1892, p. 58; Turton, 1932, p. 253.
Donax semisulcatus (*non* Hanley) Turton, 1932, p. 253.

Trigonal, ventral margin slightly arcuate in the middle; finely and regularly radially striate except near the antero-dorsal margin, a very obtuse ridge from umbo; posterior part cancellate with radial and concentric lirae, the latter on the earlier part more widely spaced than the actual growth-lines, and continued over the ridge as oblique lirae, extending a varying distance, sometimes nearly half-way across the median area. Margin internally crenulate.

White or cream, sometimes with a fawn or pinkish tinge, internally suffused with orange or salmon, and sometimes more or less violaceous anteriorly and posteriorly; periostracum corneous.

Length 29, alt. 20 mm.; also 30 × 20, and 28 × 21 mm.

Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); Natal (Krauss); False Bay, Mossel Bay, Still Bay (S. Afr. Mus.).

Remarks. The enlarged semilamellate lirae on the posterior area only begin at about alt. 1·5 mm.; thereafter they may or may not be continued on to the median area. They may be feebly or well developed, but even when conspicuous they cease when the shell has reached an altitude of 6–7 mm.

Hanley mentioned these 'raised oblique lines' as a striking characteristic of *sordidus*; his description also mentioned the arcuate lower margin; he gave the Cape of Good Hope as a definite locality. Hanley gave no such distinctive characters for *semisulcatus* from an unknown locality (1843, p. 5). Turton (1932) confused these two species, ascribing the presence of 'slanting lines' to *semisulcatus* instead of to *sordidus*.

D. semisulcatus should be deleted from the fauna-list.

More strongly radiately striate than *aemulus*, and the arcuate lower margin is distinctive; as is also (when present) the patch of oblique lirae below the umbo.

Donax aemulus Smith

Donax aemulus Smith, 1877, p. 721, pl. 75, figs. 23–25; Sowerby, 1897, p. 23; Dautzenberg, 1929, p. 606.
Donax simplex Sowerby, 1897, p. 23, pl. 8, figs. 18, 19; Turton, 1932, p. 254.
Donax elegans Odhner, 1919, p. 10, pl. 1, figs. 5–8; Dautzenberg, 1929, p. 608.
Donax productus Odhner, 1919, p. 28, pl. 2, figs. 22, 23; Dautzenberg, 1929, p. 610.
[?] *Donax lubricus* (*non* Hanley), Krige, 1933, p. 52.

Inequilateral, cuneate, anteriorly smooth, becoming finely radiately striate medianly, and distinctly lirate towards the posterior area which is not bounded by a distinct ridge; posterior area sharply cancellate with radial and concentric lirae. Ventral margin evenly convex. Margin internally crenulate.

Buff, fawn, grey, pinkish or violaceous, juveniles usually with violaceous rays; internally with a more or less distinct salmon or yellowish flush in the middle, and with or without violet rays, or sometimes violet with one or two white rays.

Length 34, alt. 23 mm.

Fossil: Pleistocene, raised beach Durban, half mile south of Umgeni, alt. 375 ft. (Geol. Survey) (? recorded by Krige as *lubricus*).

Durban and Umzinto (Natal) (Sowerby); Isezela and Durban (Natal) (S. Afr. Mus. coll. Burnup); Tongaat (north of Durban) living (S. Afr. Mus.); Delagoa Bay, living (U.W.); Inhambane, living (U.C.T.); Beira (S. Afr. Mus. coll. Ross-Frames); Chinde, living (S. Afr. Mus. coll. K.H.B.).

Distribution. Madagascar.

Remarks. Dautzenberg accepted both *elegans* and *productus*, as well as *aemulus* as valid and distinctive species. A series from Nossi Bé (U.W.). shows that *elegans* is only the adult of *aemulus*.

Distinguished from *sordidus* by the even curve of the lower margin, and the feebler radial striation medianly and its absence anteriorly, and by the absence of any oblique lirae near the umbo in the early stages.

Donax bipartitus Sow.

Donax bipartitus Sowerby, 1892, p. 58, pl. 3, fig. 74; Dautzenberg, 1929, p. 608; Jaeckel, 1931, p. 239; Cox 1939, p. 100.

Elongate trigonal, cuneate, anteriorly smooth, medianly radiately striate, ridge distinct, posteriorly cancellate with radial and concentric lirae, the latter continued over the ridge and extending a variable distance on the median part, often farther near the ventral margin than near the umbo. Margin internally crenulate.

White or cream, internally with an intense violet streak posteriorly.

Length 21, alt. 12 mm.

Fossil: Post Pliocene, Inhambane (Cox).

Durban (S. Afr. Mus. coll. Burnup; also coll. L. Kent); Tongaat (north of Durban) (S. Afr. Mus.).

35° 26′ S., 20° 56′ E., 80 metres, one (Jaeckel).

Distribution. Madagascar (Dautzenberg).

Remarks. Neither Sowerby nor Bartsch (1915) gave a precise locality. Turton did not find it at Port Alfred. It is evidently a tropical species. It was not taken by the *Pieter Faure*, and the *Valdivia* locality seems exceptionally far west, unless the fossil '*oweni*' recorded by Johnson (1904) from Port Elizabeth was misidentified (Barnard, 1962b, p. 187).

Donax madagascariensis Wood

Donax madagascariensis Wood, 1828, p. 5, pl. 2, fig. 3; Chenu, 1862, fig. 315 (not good); Sowerby, 1866, p. 306, pl. 280, fig. 16; Smith, 1877, p. 721; 1906, p. 65; Dautzenberg, 1929, p. 609;
Donax exaratus Krauss, 1848, p. 6, pl. 1, fig. 5; Turton, 1932, p. 253, pl. 68, no. 1788; Cox, 1939, p. 101.

Trigonal, cuneate, a well-marked posterior ridge; fine radial striae visible across middle part and especially on posterior part, crossed by oblique costae running from the posterior part, over the ridge and parallel with the antero-dorsal margin; these costae begin when shell has reached an altitude of 1·5–2 mm., at first thin and sharp, later becoming broader, closer together, and bluntened. Margin internally crenulate.

Pale buff or cream, umbones often livid or violaceous, interior more or less violaceous, especially an anterior patch and a posterior streak; periostracum yellowish-brown.

Length 24, alt. 17 mm.

Fossil: Post Pliocene, Inhambane (Cox); Pleistocene, Durban (Geol. Survey).

Natal (Krauss); Durban, living (S. Afr. Mus.); Tongaat (S. Afr. Mus.); St. Lucia Bay, Zululand (U.C.T.); Chinde, living (S. Afr. Mus. coll. K.H.B.).

Distribution. Quelimane (Smith); Madagascar (Dautzenberg).

Remarks. Smith remarked that the growth-lines were visible on the oblique costae but not in the intervals; in young shells they are visible, but in older shells when the costae have become broader they are usually not visible; the costae also obscure to a large extent the radial striae, except on the posterior part.

Donax faba Gmelin

Donax radians Chenu, 1862, fig. 310.
Donax faba Gmelin, Sowerby, 1866, p. 312, pl. 283, figs. 108, 109; Prashad, 1932, p. 204 (references); Macnae & Kalk, 1958, pp. 36, 92, 129, fig. 21 *c*; Franca, 1960, p. 98, pl. 28, fig. 6.

Ovoid, not cuneiform, antero-dorsal margin convex, no ridge posteriorly, posterior part with concentric more or less rugulose lamellae crossed by fine radial striae. Margin internally smooth (subgen. *Latona*).

Colour variable: greyish, violaceous, pinkish, buff or yellowish, uniform or more usually with radiating streaks (see Macnae & Kalk, p. 92).

Length 25, alt. 19 mm.

Delagoa Bay (U.W.; also Franca).

Distribution. Madagascar, Indo-Pacific.

Remarks. Although Dautzenberg (1929) recorded both *abbreviatus* Lam. and *faba*, and Prashad did not include the former in the synonymy of the latter, there seems to be a very close similarity. In the present material the shape varies, some shells resembling Sowerby's (1866) figures of *faba*, others the figures of *abbreviatus*. In any case *faba* has priority.

Braga (1952, p. 114, pl. 10, fig. 12) recorded the very closely allied *cuneata* Linn. also from Delagoa Bay.

Donax incarnatus (Chemn.) Schröter

Donax incarnatus (Chem.) Schröt., Chenu, 1862, fig. 307; Sowerby, 1866, p. 311, pl. 283, figs. 98, 99; Lynge, 1909, p. 215, pl. 4, figs. 12, 13; Dautzenberg, 1929, p. 609; Macnae & Kalk, 1958, pp. 92, 129.

Subtriangular, elevated; height about 1¼ in length, ventral margin flattened; posteriorly cancellate with radial striae and concentric undulating rugae.

Length 19–20, alt. 16 mm. (Sowerby's figure); 22 × 17 mm. (Lynge's figure).

Delagoa Bay (Macnae & Kalk).

Distribution. Madagascar; India; Siam.

Donax bertini Pilsbry

Fig. 30 *b*

Donax bertini Pilsbry, 1901, p. 189; Turton, 1932, p. 254.
Donax nereia Turton, 1932, p. 254, pl. 69, no. 1794 (= juv.).
[Non] Dautzenberg 1929, p. 607 (*nom. preocc.*, for *granosus* Römer, *non* Lam.).

Elongate, anteriorly acuminate, posteriorly rounded, umbo at posterior third, ridge feeble; faint radial striae medianly (also anteriorly but very faint), posteriorly with 12–14 ribs, oblique to the dorsal margin, with regular radial striae in the intervals. The ribs are slightly bent dorsally before they cross the umbonal ridge, not very noticeable in lateral view, but clearly seen in posterior view. Margin internally crenulate.

White, fawn, or violaceous.

Length 15·5, alt. 6 mm.

Fossil: Pleistocene, Durban (Geol. Survey).

In ballast from South Africa (Pilsbry). Port Alfred (Bartsch, Turton);

East London (S. Afr. Mus.); Durban, living (S. Afr. Mus. coll. Burnup); Durban Harbour, one living (S. Afr. Mus. P.F. coll.).

Inhambane, living (U.C.T.).

Remarks. Sowerby identified the P.F. specimen as *nitidus* Desh., and Burnup likewise identified his shells as *nitidus*. All the present specimens are quite different from Sowerby's description of the East Australian *nitidus* (1866, p. 314, pl. 282, fig. 75).

Turton claimed to have found a single shell at Port Alfred which agreed with '*nitidus* from S. Africa' in the British Museum, and thus added another name to his list.

Turton's *nereia* is the juvenile: the riblets described as being on the 'anterior' end, and shown in the photo on the posterior end clearly indicate the synonymy.

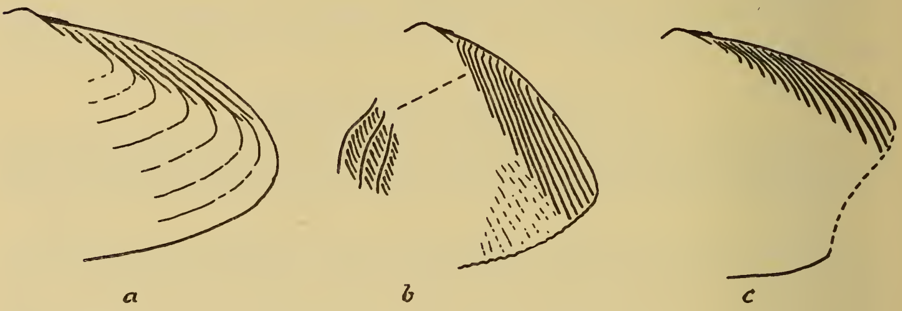

Fig. 30. Posterior end of: *a*, *Donax burnupi* Sow. *b*, *bertini* Pilsbry. *c*, *Donax* sp., off Tugela River.

subgen. CAPSELLA

Thin, without posterior ridge, margin internally smooth.

Donax (*Capsella*) *burnupi* Sow.

Fig. 30 *a*

Donax burnupi Sowerby, 1894, p. 377; 1897, p. 23, pl. 6, fig. 26; Turton, 1932, p. 253, pl. 68, no. 1789.

Elongate oval, smooth, umbo about $\frac{2}{5}$ from posterior end, posteriorly with spaced sulci obliquely crossing the growth-lines, 8–10 on shells *c.* 15–20 mm. long, 12 on a shell 27 mm. long.

Externally buff, fawn, or brown, almost uniform or with brown rays on pale ground, or vice versa; internally brown, fawn, or violaceous, often with an orange flush in middle, both ends being violaceous.

Length 27, alt. 12·5 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Natal (Sowerby); False Bay and Still Bay (S. Afr. Mus.); Port Elizabeth, living (S. Afr. Mus. coll. R. Kilburn); Port Alfred (Bartsch, Turton).

False Bay, 10–13 fathoms, 2 living; also 42 fathoms, one valve (together with *longissimus*); off Cape Infanta, 40 fathoms, one valve; Algoa Bay, 10–16 fathoms, one living; off Nieca River (East London area), 43 fathoms, one valve; Natal (no exact locality), 3 valves; off Cape Vidal (Zululand), 22 fathoms, one valve (with many *longissimus*) (S. Afr. Mus. P.F. coll.).

False Bay, 27 metres (U.C.T.).

Remarks. In the valve from False Bay, 42 fathoms, 25 mm. long, there are only 2 sulci near the umbo; and in the valve from Cape Vidal, 21 mm. long, there are only 3.

Donax (*Capsella*) *longissimus* J. & T.

Donax (*Capsella*) *longissimus* Jaeckel, 1931, p. 240, pl. 9(4), fig. 116.

Elongate oval, smooth, umbo a little behind middle, no sculpture except growth-lines.

Buff or cream, umbones brownish, with 2 or 3 darker rays, internally fawn.

Length 36, alt. 15·5 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Algoa Bay, and 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel).

Keurbooms River beach (Plettenberg Bay), 6 valves (S. Afr. Mus. coll. K.H.B.).

False Bay, 42 fathoms, 8 valves; off Cape Infanta, 40 fathoms, 4 valves; Algoa Bay, 30 fathoms, 4 juv. valves; off Umkomaas (Natal), 13 fathoms, 16 valves; off Cape Vidal (Zululand), 22 fathoms, 115 valves (S. Afr. Mus. P.F. coll.).

Remarks. It is a little remarkable that this shell should have remained so long undescribed, if indeed it is not merely a perfectly smooth form of *burnupi*. Valves from Cape Vidal were identified by Sowerby as *burnupi*, as were also 2 examples of typical *burnupi* from other localities.

The growth-lines on the posterior part are frequently slightly enlarged, as seems to be indicated in Jaeckel's figure. But the sulci as found in *burnupi* cut across the growth-lines, and when present are immediately noticeable.

In the present material there are many more valves of *longissimus* than of *burnupi*. Among 75 (not counting *circa* 40 worn valves) smooth valves from Cape Vidal only one *burnupi* was found; but among 9 valves from False Bay there was one *burnupi*; and in the Sedgefield collection (as submitted to me) there was one of each species.

A little more evidence would be welcome, but I think there is little doubt that *longissimus* will eventually be merged with *burnupi*.

Jaeckel said his species belonged to the same group (*Capsella*) as the West African *owenii* (Gray) Hanley, although the latter appears (Chenu, 1862, fig. 318; and Sowerby, 1866, pl. 280, fig. 8) to have a different shape and also a distinct posterior ridge; in fact, Sowerby said 'area postica biangulata'. Does *owenii* belong to the subgen. *Capsella*?

It seems scarcely possible that Sowerby misidentified the Port Elizabeth shell (1892, p. 58) as *owenii*; but the provenance of that shell cannot now be checked.

Donax (? *Capsella*) sp.

Fig. 30 *c*

A single worn valve from off Tugela River, 37 fathoms (S. Afr. Mus. No. A9544, P.F. coll.) differs from both *bertini* and *burnupi* in the posterior sculpture.

No posterior ridge. Margin internally not crenulate (but worn). Posteriorly with *c.* 15 or 16 sulci; as in *burnupi* they do not extend below a line from umbo to posterior corner (contrast *bertini*); they are slightly curved, more or less concentric with the dorsal margin, whereas in *burnupi* they are straight.

Length 23 (but posterior corner broken), alt. 11·5 mm.

More material is required.

Fam. **Psammobiidae**

Psammobia costulata Turton

Psammobia costulata Turton, 1822; Reeve, 1857, pl. 6, fig. 38; Smith, 1885, p. 90; Jaeckel, 1931, p. 239.

[?] *Psammobia vespertina* (*non* Gmelin), Sowerby, 1892, p. 56.

Equivalve, equilateral, oval, rounded at both ends; fine concentric growth-lines; between postero-dorsal margin and a line from umbo to postero-ventral corner about a dozen radial costulae, often with very fine intermediaries. Pallial sinus extending to vertical from umbo, its lower margin united for most of its length with the pallial line.

More or less pink, especially in front of umbo, often with disconnected radial splashes.

Length 24, alt. 13, thickness (valves together) 5·5 mm.

Still Bay (S. Afr. Mus. coll. Muir); Port Elizabeth (Sowerby).

35° 29′ S., 21° 3′ E., 102 metres; 35° 26′ S., 20° 56′ E., 80 metres (Jaeckel).

False Bay; Algoa Bay; off Nanquas Peak (east end of Algoa Bay); Kowie area; East London area; Illovo, Tongaat and Umhlanga (Natal); to Tugela River; 22–66 fathoms; living and valves (S. Afr. Mus. P.F. coll.).

Distribution. Europe, Mediterranean, Madeira, Canary Islands.

Remarks. Examples from the *Pieter Faure* collection were identified by Sowerby as *costulata*, but not recorded in his report in the *Marine Investigations*. Hence Jaeckel's statement that this species was an addition to the fauna-list.

Common and widely distributed from False Bay eastwards, but not reported from the west coast of South Africa.

In view of the P.F. locality records, Sowerby's record of *vespertina* probably applies to the present species. Moreover he identified a P.F. specimen from False Bay as *vespertina*, which does not differ from specimens (some of them also from False Bay) he identified as *costulata*.

Psammobia maculosa Lam.

Psammobia maculosa Lamarck, 1818, p. 513; Dautzenberg & Fischer, 1914, p. 215, pl. 6, figs. 1–3.
Psammobia ornata Sowerby, 1897, p. 22.
[?] *Psammobia albanyana* Turton, 1932, p. 250, pl. 67, no. 1770.
Gari maculosa (Lam.), Prashad, 1932, p. 298 (references).

Durban (Sowerby, Smith; also S. Afr. Mus.). ? Port Alfred (Turton). St. Lucia Bay and Kosi Bay (U.C.T.).

Algoa Bay 52 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Madagascar, Indo-Pacific.

Remarks. Smith said *corrugata* was always distinguished by the wrinkles on the posterior area, but there are no wrinkles on the specimen, 45 × 24 mm., identified by Tomlin as *ornata.* Prashad regarded these two species, and also *marmorea* and *rubicunda,* as synonyms of *maculosa,* based on variations in colour and the coarseness of the posterior sculpture.

The single valve from Algoa Bay is 27 × 15 mm., and does not differ except in size from the above specimen identified by Tomlin.

A specimen said to have come from 'Cape Peninsula' has been in the South African Museum for many years. As the donor kept a small private museum for teaching Natural History, I formerly doubted the provenance of this specimen. Recently (1961), however, 3 specimens were obtained in the Simon's Bay area in False Bay. The largest is 65 × 35 × 18 mm. All of them resemble the other specimens here recorded in having no corrugations. Now there are specimens also from Gordon's Bay (False Bay) (Dr. Ackert); and from Still Bay (Mrs. Connolly).

Psammobia pallida Desh.

Psammobia pallida Deshayes, 1855, p. 323; Smith, 1885, p. 93; 1903, p. 398.

Posterior margin obliquely subtruncate; obliquely striated from above downwards and forwards, ceasing at a line separating the anterior-median glossy area from the matt posterior area.

Cream with lilac or violaceous tinge, with darker rays.

Length 40, alt. 20, thickness (valves together) 8·5 mm. Length up to 50 mm. (Smith, 1903).

Fossil: Pleistocene, Durban (Geol. Survey).

Durban (Smith); Delagoa Bay (U.W.); Inhambane (U.C.T.).

Distribution. Red Sea, Indo-Pacific.

Psammotellina capensis Sow.

Psammotellina capensis Sowerby, 1889a, p. 13, pl. 1, fig. 19; 1892, p. 56, pl. 2, fig. 61; Turton, 1932, p. 251.
Psammotellina capensis var. *livida* Turton, 1932, p. 251.
Psammotellina lara Turton, 1932, p. 251, pl. 68, no. 1775.
Psammotellina pyrrha Turton, 1932, p. 251, pl. 68, no. 1778.
Ervilia purpurea (*non* Desh.), Sowerby, 1904, p. 15.

Pallial sinus not very deep, extending to about midway between posterior adductor scar and vertical from umbo (cf. Turton, pl. 68, no. 1775, internal view).

Length 17, alt. 10, thickness (valves together) 6 mm.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton). Cape Flats, False Bay side, recent estuarine deposit (S. Afr. Mus.). Still Bay (S. Afr. Mus. coll. Muir). Keurbooms River estuary (S. Afr. Mus. coll. K.H.B.).

Buffalo River, East London (S. Afr. Mus. P.F. coll.).

Breede River mouth, Great Brak River mouth, Sundays River mouth, Bushmans River mouth, Hamburg (between Port Alfred and East London) (U.C.T.).

Remarks. Common in lagoons and estuaries.

Sowerby (1904) identified the Buffalo River examples as *Ervilia purpurea* with a query; the specimens he returned (one bivalve shell and one valve) are *P. capensis*.

Psammotaea lunulata (Desh.)

Capsa (*Capsella*) *lunulata* Deshayes, 1855, p. 349.
Psammotaea lunulata (Desh.), Smith, 1903a, p. 398; Turton, 1932, p. 251.

Oval, with growth-lines only. Pale, with dark greenish-brown periostracum, internally violaceous.

Length 35, alt. 20, thickness (valves together) 10 mm.

Durban (Smith; also S. Afr. Mus. coll. Ross-Frames); Scottburgh, Natal (S. Afr. Mus. coll. Burnup); Port Alfred (Turton).

St. Lucia Bay, Amatikulu estuary, and Inhambane (U.C.T.).

Distribution. Ceylon, Philippines.

Asaphis dichotoma (Anton)

Sanguinolaria dichotoma Anton, 1838, p. 4.
Asaphis deflorata von Martens, 1880, p. 330; Cox, 1927, p. 81, pl. 16, fig. 3.
Asaphis dichotoma (Anton), Prashad, 1932, p. 306 (references).

Numerous radiating ribs, some of them dichotomous a short distance from the umbo, with occasional intermediaries, the ribs slightly stronger and more spaced on the posterior area.

White, yellowish near umbo; internally suffused with yellow, the whole margin, especially posteriorly, and including the posterior adductor scar, deep blackish-violet, shading through pinkish into the yellow suffusion.

Length 55, alt. 34, thickness (valves together) 26 mm.

Fossil: Pliocene, Zanzibar (Cox).

Mozambique Island (S. Afr. Mus. A7449. coll. K.H.B.).

Distribution. Red Sea, east coast of Africa, Madagascar, Indo-Pacific.

Remarks. Prashad followed Anton, Mörch, and Bertin in separating the Indo-Pacific *dichotoma* from the West Indies *deflorata* Linn. on account of the dichotomous ribs.

Fam. **Semelidae**

Semele radiata (Rüppell, Rve.)

Amphidesma radiata Rüppell MS. Reeve, 1853, pl. 2, fig. 12.
Semele radiata (Rüpp. Rve.), Lamy, 1914, p. 337; Braga, 1952, p. 119, pl. xi, fig. 8; Franca, 1960, p. 99, pl. 28, fig. 8.

Delagoa Bay (Braga, Franca; also U.W.).

Distribution. Madagascar.

Remarks. Braga's and Franca's identification is accepted in the absence of material of other species for comparison.

Sowerby (1897, p. 22) listed *cordiformis* (Chemn.) from Natal.

Iacra seychellarum (A. Adams)

Scrobicularia seychellarum Adams, 1856, p. 53.
Iacra seychellarum (Adams), H. & A. Adams, 1856, p. 409; Sowerby, 1897, p. 22.
Syndesmya (*Iacra*) *lactea* Odhner, 1919, p. 28, pl. 2, figs. 20, 21.
Iacra lactea (Odhner), Dautzenberg, 1929, p. 635.

Sculptured with divaricating lirae separated by impressed striae: on anterior half they are concentric and parallel with the growth-lines and antero-ventral margin; at the half-way line the striae bend downwards at *c.* 140° and run obliquely; at a line from umbo to postero-ventral corner they cease, and an independent series of finer oblique striae slopes upwards to the dorsal margin. At 10 mm. alt. there are 4 concentric lirae in a space of 1 mm.

The postero-dorsal lirae on two left and two right valves from Natal are noticeably finer and closer together than either the oblique or the concentric lirae. On a Nossi Bé shell, however, they are fine on the left valve, but on the right valve are as coarse as the other lirae or even coarser near the margin.

Pallial sinus in left valve reaching to the anterior adductor scar, but not so far in the right valve.

Length 15, alt. 12 mm.

Natal (Sowerby; also S. Afr. Mus. coll. Burnup, and coll. L. Kent); Delagoa Bay (S. Afr. Mus. coll. K.H.B.).

Distribution. Seychelles. Nossi Bé (U.W.).

Remarks. Odhner identified his Madagascan specimens as *lactea* Dnkr., which he thought was probably the same as *seychellarum*.

Iacra trotteriana (Sow.)

Strigillia trotteriana Sowerby, 1894, p. 376; 1897, p. 23, pl. 6, fig. 32.

Sculpture similar to that of *seychellarum*, but striae more widely spaced: thus at 10 mm. alt. only 1½ concentric lirae in a space of 1 mm.; also the concentric sculpture is less conspicuous. Pallial sinus as in *seychellarum*.

White, internally with a salmon or yellowish flush.

Length 14, alt. 13 mm.

Durban (Sowerby; also S. Afr. Mus. coll. Burnup, one living); Tongaat (S. Afr. Mus.).

Remarks. The internal ligament pit shows that this is not a *Strigilla.* Probably only a form of *seychellarum.*

Theora ovalis Smith

Theora ovalis Smith, 1904a, p. 39, pl. 3, fig. 17.
[?] *Aligena ovalis* (Smith), Bartsch, 1915, p. 202; Turton, 1932, p. 243.

Almost equilateral, and regularly oval. Port Alfred specimens sent to South African Museum by Turton have an oblique internal ligament pit, but Smith's words 'fossa ligamenti margine incrassato pone limitata' do not apply. This thickened upper margin, like a flange, is well shown in Bartsch's pl. 49, figure 3, of *alfredensis.* Unfortunately Smith did not figure the hinge.

The right valve has an anterior and posterior lateral groove, but in the left valve the (lamellate) teeth are evanescent. The pallial sinus is not clear.

Length 9·5, alt. 7 mm. (Smith).

Oval specimens similar to those from Port Alfred are in South African Museum from Table Bay and False Bay.

Off Saldanha Bay, 87 fathoms (U.C.T.).

Theora alfredensis Bartsch

Theora alfredensis Bartsch, 1915, p. 206, pl. 45, fig. 8, pl. 49, fig. 3; Jaeckel, 1931, p. 238.

Bartsch illustrated a shell slightly less in altitude, and bluntly pointed at the posterior end (? Bartsch: anterior). The incrassate dorsal margin of the ligament pit in the present specimens as in Bartsch's figure. The lateral 'teeth' as above described for *ovalis.*

Length 9·2, alt. 5·5 mm. (Bartsch); 9·5 × 6, 10 × 6·5, and 10·75 × 7 mm. (S. Afr. Mus.).

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.).

Port Alfred (Bartsch); St. Francis Bay, 80 metres (Jaeckel).

Algoa Bay, 52 fathoms, 4 living, 6 valves; off Hood Point (East London), 49 fathoms, 5 valves; off O'Neil Peak (Zululand), 90 fathoms, 12 valves (S. Afr. Mus. P.F. coll.).

29° 53′ S., 31° 06′ E., 71 metres, 2 living; 31° 41′ S., 29° 33′ E., 90 metres, 2 living (U.C.T.).

Remarks. Two species, differing only slightly in shape, seem to be indicated. The Zululand valves appear to be conspecific.

The single fossil valve is broken at both ends, but has the incrassate dorsal margin of the ligament pit.

Abra longicallus (Scacchi)

Abra longicallus (Scacchi) Barnard, 1963b, p. 450.

I have seen one living specimen in coll. Mrs. H. Boswell, taken off Cape Point together with *Surcula sulcicancellata* Brnrd. (1958), the depth being probably about 200 fathoms.

Leptomya psittacus Hanley

Leptomya psittacus Hanley, 1882, p. 576; 1883, p. 541, pl. 12, fig. 6.

Described by Hanley from an unknown locality. The measurements given: 1·2 × 1 in., do not quite correspond with the figure which was stated to be natural size. In fact the present valves when superimposed on Hanley's figure correspond exactly not only in size but in outline. There can be little doubt, therefore, about the specific identification. There appear to be no other records of this species since its description.

Upper margin of pallial sinus descending in a nearly straight line from the posterior adductor scar to midway between adductor scar and vertical from umbo, where it joins the pallial line with only a slight bend.

Length 32, alt. 23 mm. Pure white.

Bazarute Island, Portuguese East Africa, 2 shells collected alive by Mr. A. E. Dichmont, 1959 (S. Afr. Mus. A9546).

Remarks. From Dar-es-Salaam Jaeckel & Thiele (1931, p. 241) recorded *Raeta bracheon* Sturany, which closely resembles *R. pulchella* Ad. & Rve., as Lynge (1909, p. 224) pointed out. Lamy, however, (1918, p. 358, footnote 2) stated that *bracheon* was a *Leptomya*: *L. cochlearis* Hinds.

The Dar-es-Salaam specimen should be re-examined; it may be a *Leptomya*, not a *Raeta*, and possibly the same as *psittacus*. *L. cochlearis* as figured by Hanley (1883, pl. 12, fig. 8) and Gravely (1941, fig. 22 *e*) differs slightly but distinctly in shape from *psittacus*. It occurs in India and Gulf of Suez (*bracheon*).

Fam. **Tellinidae**

The names of several well-known Indo-Pacific species of *Tellina* have been recorded from Durban or Natal, but there is some doubt as to their being inhabitants of South African waters. *Tellina* being one of the favourites among collectors, the suspicion arises that some of the records in question were based on specimens which emanated originally from Mauritius, the east coast of Africa, or even farther afield.

For *T. crassa* Turton, 1932 (*non* Pennant), see *Diplodonta subradiata*.

Tellina madagascariensis Gmelin

Fig. 31 *a*

Tellina madagascariensis Gmelin, 1790, p. 3237; Jaeckel, 1931, p. 236; Gevers, 1932, p. 74; Nicklès, 1950, p. 224, fig. 435.
Tellina rosea Spengler, 1798; Johnson, 1904, p. 11; Smith in Rogers, 1906c, p. 294; Schwarz, 1910, p. 115; Haughton, 1932, p. 37.
Tellina cf. *perna* Newton, 1913, p. 341, pl. 22, figs. 4, 5; Barnard, 1962b, p. 187.
Tellina albinella var. *alfredensis* Bartsch, 1915, p. 205, pl. 46, figs. 7, 8; Turton, 1932, p. 246.
[*Non*] *Tellina madagascariensis* Gmelin, Smith, 1891, p. 426 [= *manumissa* Melvill, 1898].

Right valve nearly flat, left valve convex; umbonal ridge more distinct on right valve. Pallial sinus not reaching anterior adductor scar, its upper border evenly curved, joining the pallial line at about 60°–80°, *not curving backwards.*

Length 78, alt. 43 mm.; also 67 × 42, 57 × 32, 52 × 30, 42 × 22, 31 × 15, 23 × 12, 20 × 10, 15 × 7·5 mm. Valves together: 72 × 43 × 16, 41 × 22 × 7, and 29 × 15 × 4 mm. Length up to 90 mm. (Nicklès).

Fossil: Pleistocene, Cape Cross north of Swakopmund (South West Africa) (Gevers); Saldanha Bay (Haughton); Port Elizabeth (Johnson, Schwarz, Newton); Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.); Little Brak River (Smith in Rogers).

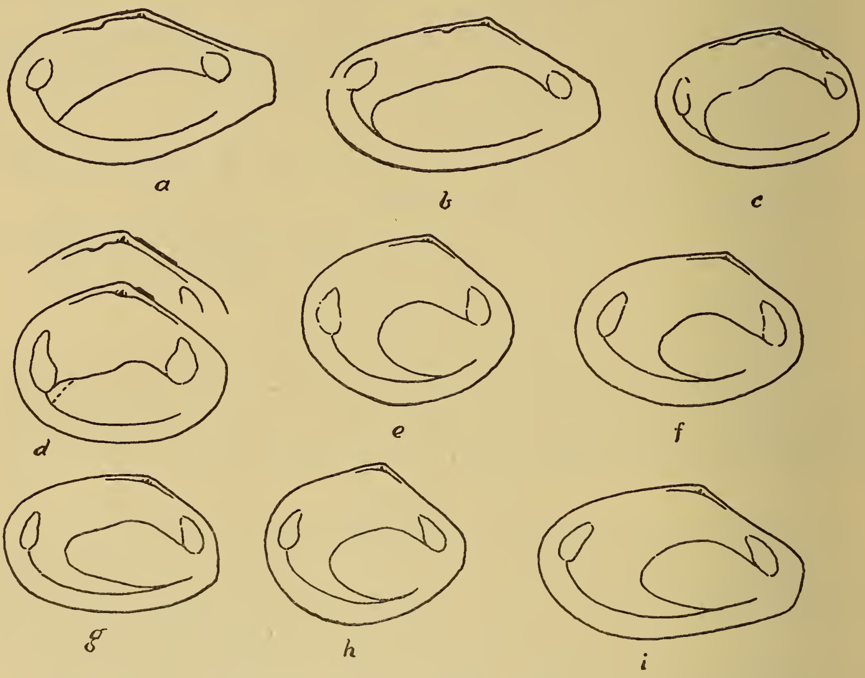

Fig. 31. Inner views of right valve of: *a*, *Tellina madagascariensis* Gmelin. *b*, *gilchristi* Sow. *c*, *analogica* Sow. *d*, *Macoma litoralis* (Krss.) with short ligament; upper figure and the dotted line in lower figure, with long ligament. *e*, *ordinaria* Sow. *f*, *crawfordi* Sow. *g*, *retrorsa* Sow. *h*, *levior* Sow. *i*, *inclinata* Sow.

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Hout Bay (west side of Cape Peninsula), False Bay, Hermanus, Knysna (S. Afr. Mus.).

Algoa Bay, 21 fathoms, 7 living (S. Afr. Mus. P.F. coll.); False Bay (U.C.T.).

Distribution. Madagascar (Gmelin, von Martens, Dautzenberg); Great Fish Bay, Angola (Jaeckel); Loango (von Marten , Jaeckel); French Congo to Angola (Nicklès).

Remarks. The altitude in juveniles is twice in the length, but increases in older shells until it is about 1⅔ in the length.

I have seen Newton's specimen from Redhouse, Port Elizabeth: it is this species, not *perna*. He contrasted it with *perna*, but did not compare it with *rosea*, previously recorded by Johnson and Schwarz from the same district. If he had done so, he would have noticed the difference in the pallial sinus; in *perna* the anterior border *curves backwards* before joining the pallial line at a very acute angle. The narrowness of Newton's shell is due to abrasion of the ventral margin.

Tellina triangularis Chemn.

Tellina triangularis Chemn., Hanley in Sowerby, 1846, p. 294, pl. 60, fig. 150; Turton, 1932, p. 247.

Right valve with oblique striae at posterior end; sometimes a few also on the left valve, but much less distinct. Pallial sinus in left valve extending to the anterior adductor scar; in right valve not quite reaching the scar, a gap of about 2 mm. in a 25 mm. long shell, about 4 mm. in a 45 mm. long shell, bending down to join the pallial line perpendicularly. Two cardinal teeth in right valve, the posterior one bifid, one bifid cardinal in left valve, a dentiform anterior lateral near the anterior cardinal in right valve.

Length 49, alt. 35 mm.; valves together: 45 × 33 × 11 mm., 30 × 21 × 6, 21 × 14 × 5, 16·5 × 11 × 3·5 mm.

Fossil: Pleistocene, Alexander Bay (Haughton 1932); Velddrif, Berg River (west coast) (Krige, A. V. 1927); limestone deposits Klein River estuary, Hermanus (S. Afr. Mus.); Little Brak River, Mossel Bay (S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin); raised beach deposit Knysna lagoon.

Cape (Sowerby); Port Alfred (Smith, Bartsch, Turton).

Table Bay and False Bay (S. Afr. Mus.).

Saldanha Bay and False Bay (U.C.T.).

Remarks. Turton has mistaken the anterior and posterior ends. The oblique striae are shown in Hanley's figure but not mentioned in his description.

Tellina analogica Sow.

Fig. 31 *c*

Tellina analogica Sowerby, 1904, p. 12, pl. 7, fig. 4.

Hinge teeth and pallial sinus as in *gilchristi*.

Saldanha Bay, 55 fathoms (Sowerby, P.F. material).

Off Baboon Point (Saldanha Bay), 31 fathoms, 4 living, one valve (S. Afr. Mus. P.F. coll.).

St. Helena Bay (32° 24′ S., 18° 07′ E.), 69 metres, living (s.s. *Africana* per U.C.T.).

Type *ubi*?

Like several other molluscs living in the Saldanha Bay area the shells are more or less corroded.

One specimen from St. Helena Bay, length 18, alt. 14 mm., is subtrigonal, almost equilateral, the antero- and postero-dorsal margins subtending an angle of 100°, the antero-inferior margin rounded.

Not sharply distinguished from *gilchristi*.

Tellina gilchristi Sow.

Fig. 31 *b*

Tellina natalensis (*non* Phil., Krauss), Smith, 1885, p. 102.
Tellina gilchristi Sowerby, 1904, p. 12, pl. 7, fig. 3; Jaeckel, 1931, p. 237.
Tellina vidalensis (*non* Sow.), Bartsch, 1915, p. 205; Jaeckel, 1931, p. 237.
Tellina becki Turton, 1932, p. 247, pl. 66, no. 1741.
Tellina sp.? Turton, 1932, p. 249, pl. 67, no. 1754 (?).

Nearly equilateral, anterior part $1\frac{1}{4}$–$1\frac{1}{3}$ in posterior part, antero- and postero-dorsal margins subtending an angle of *c.* 130° (120°–140°), postero-dorsal margin straight, posterior margin obliquely subtruncate; concentric growth-lines forming fine close costulae, some of them slightly sublamellate on posterior area. Right valve with 2 cardinal teeth, the posterior bifid, an anterior and a posterior dentiform lateral tooth, the anterior much nearer to the cardinals; left valve with 2 cardinals, the anterior bifid, the posterior weak, no laterals. Pallial sinus extending to near the anterior adductor scar, its anterior border curving slightly backwards to join the pallial line at the vertical from top of anterior adductor scar.

White or pinkish, often with darker zones, and frequently with pink radial streaks.

Length 27, alt. 15·5, thickness (valves together) 6 mm.; 24 × 15 × 6 mm. (Sowerby).

False Bay, 30–50 fathoms (Sowerby, P.F. material).

False Bay, 7–20 fathoms (Smith); St. Francis Bay and Algoa Bay, 80 metres (Jaeckel); Port Alfred (Bartsch, Turton).

False Bay, off Cape Infanta, Sebastian Bay, off Cape St. Blaize, Mossel Bay, St. Francis Bay, Algoa Bay, off False Island and Nanquas Peak (east end of Algoa Bay), off Kowie (Port Alfred); 22–50 fathoms, living shells and numerous valves (S. Afr. Mus. P.F. coll.).

Living: False Bay; 34° 35′ S., 21° 11′ E., 75 metres; and Algoa Bay, 17 fathoms; Langebaan (Saldanha Bay) (U.C.T.). St. Helena Bay (32° 24′ S., 18° 07′ E.), 69 metres (s.s. *Africana* per U.C.T.).

Distribution. Jaeckel recorded it from Great Fish Bay, Angola; the identification requires confirmation; it may possibly be *analogica.*

Remarks. Although he had numerous examples, Sowerby seems to have given measurements of, and figured, a rather short example; normally the length is greater proportionately to the altitude.

There is no doubt that the specimens taken by H.M.S. *Rattlesnake* and H.M.S. *Challenger* in False Bay (Smith 1885) were conspecific with the species later described by Sowerby. It is very common in that area, although seemingly never washed up on shore. At least there is no record, and South African Museum has no valves collected on the beach.

The specimens collected by Stimpson in 1853 and identified by Bartsch as *vidalensis* are also undoubtedly *gilchristi.* Dr. Rehder (*in litt.* to Prof. Day, University of Cape Town, March 1955) suggested that these same specimens collected by Stimpson might be *tulipa* Hanley 1844 and 1846, from an unknown locality. It is better, however, to ignore early 'collector's species', especially from unknown localities.

Smith (1885) had no choice except to identify his specimens with *natalensis* or institute a new species. In doing the former he seems to have relied on colour, and ignored Krauss's statement that *natalensis* had no lateral teeth.

Tellina natalensis Krss.

Tellina natalensis Krauss in Philippi, 1846, p. 91, pl. 4, fig. 4; Krauss, 1848, p. 3; Smith, 1904a, p. 25; Bartsch, 1915, p. 205; Turton, 1932, p. 247.
Tellina prismatica Sowerby, 1897, p. 22, pl. 6, fig. 29.
Tellina scalpellum (*non* Hanley), Day & Morgans, 1956, p. 308.
Tellina planissima (*non* Anton), Sowerby, 1897, p. 22.
[Non] *Tellina natalensis* Krss., Smith, 1885 [= *gilchristi*].

Inequilateral, anterior part twice in posterior part (Krauss 1¾–2 (S. Afr. Mus.), postero-dorsal margin steeply sloping, slightly convex, forming a blunt corner with the ventral margin; fine close growth-lines, not forming costulae, but some of them slightly raised (sublamellate) on posterior area. Right valve with 3 cardinal teeth, the posterior one bifid, the middle one smaller than the others, left valve with 2 feeble teeth (Krauss: a thick bifid tooth), both valves without lateral teeth. Pallial sinus extending to near anterior adductor scar, its anterior border curving backwards to join pallial line.

Rose-red, with 3–4 pale radial streaks (Krauss). Iridescent (Sowerby).

8·7 × 4·8 Par. lines (Krauss) = *c.* 18 × 10 mm.; 16 × 8 mm. (Sowerby).

Fossil: Pleistocene, Durban (Geol. Survey).

Natal coast (Krauss); Durban (Sowerby; also S. Afr. Mus.); Port Alfred (Smith, Bartsch, Turton); 29° 53′ S., 31° 06′ E., 71 metres (U.C.T.). Inhambane (U.C.T.).

Remarks. Distinguished from *gilchristi* by shape, growth-lines not forming costulae, and absence of lateral teeth in both valves; from *vidalensis* by the two latter characters.

Tomlin identified a Durban specimen as the Philippine *scalpellum* Hanley 1844, but without suggesting that *natalensis* was synonymous. The types of Hanley and Krauss might be compared. I was responsible for the Day & Morgans (1956) record of *scalpellum*, having compared U.C.T. specimens with the shell identified by Tomlin as Hanley's species. But further study has convinced me that the shell identified by Tomlin is really Krauss's *natalensis*. The latter name is therefore retained.

Krauss said the pallial sinus was very large, but did not state how far it actually extended anteriorly. I have not seen the figure in Philippi.

Tellina vidalensis Sow.

Tellina vidalensis Sowerby, 1904, p. 13, pl. 7, fig. 5.
Not Bartsch 1915, nor Jaeckel 1931, = *gilchristi*.

Inequilateral, anterior part 1¾–2 in posterior part, postero-dorsal margin sloping, convex, posterior margin obliquely subtruncate; close concentric growth-lines forming fine costulae, some on the posterior area slightly raised. Right valve with 2 cardinal teeth, the posterior bifid, anterior and posterior laterals about equidistant from the cardinals, left valve with a strong bifid anterior and a feeble posterior cardinal, laterals obsolescent. Pallial sinus extending nearly to anterior adductor scar, anterior border curving slightly backwards to join the pallial line.

Salmon pink or rose.

15·5 × 8·5 × 4·25 mm. (Sowerby); 19 × 10 mm. (S. Afr. Mus.).

Off Cape Vidal (Zululand), 13 fathoms, one living (Sowerby, P.F. material).

Off Tugela River, 37 fathoms, 10 valves; off Morewood Cove, 27 fathoms, 28 valves; off Umhloti River, 40 fathoms, two living, 6 valves, all juv.; and 27 fathoms, one valve; off Umhlanga River, 22–26 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Type in South African Museum. Reg. no. 14848.

Remarks. Distinguished from *gilchristi* by being more inequilateral, and having a distinct (though not strong) posterior lateral tooth in the left valve.

Jaeckel picked out one left valve from numerous examples of *gilchristi* taken in St. Francis Bay, and said it might belong (dürfte gehören) to *vidalensis.* Far more likely it was a slightly abnormal or worn *gilchristi.*

Cape Vidal. The headland near St. Lucia Bay was named after Vice-Admiral A. T. E. Vidal, R.N. (1790–1863). As Capt. Vidal he surveyed and charted the Azores, Canary Islands, Cape Verde Islands, and the coast of west Africa. I am indebted to the South African Naval Hydrographic Office, Mowbray, Cape Town, for obtaining this information from the Admiralty Hydrographer, London. See also *Memoirs of Hydrography* by Dawson, 1885.

Specimina inquirenda

Living specimens from Durban Bay and Richards Bay (U.C.T.) are a little difficult to refer to *gilchristi*, *natalensis*, or *vidalensis*, because the pallial sinus meets the lower corner of the anterior adductor scar and joins the pallial line without any recurrent bend.

Shells from both localities resemble *natalensis* in shape. The teeth of the Durban shells resemble those of *vidalensis.* In the single shell from Richards Bay, however, the cardinals resemble those of *natalensis*, the anterior one in the right valve forming a rather conspicuous knob; and the lateral are stronger than in any of the above three species.

Much more material of these pink Natal *Tellinas* should be studied.

Tellina ludwigii Krss.

Tellina ludwigii Krauss, 1848, p. 3, pl. 1, fig. 2; Barnard, 1962b, p. 194.

Tellina queketti Sowerby, 1897, p. 22, pl. 8, figs. 16, 17; Schwarz, 1910, p. 115 (*quecketti* [*sic*]); Broekhuysen & Taylor, 1959, p. 292.

Tellina queketti var. *radiata* Sowerby, 1897, p. 22.

Broadly oval, nearly equilateral; smooth, with fine growth-lines only. Cardinal teeth often indistinct, no lateral teeth. Ligament very short, its supporting ridge prominent. Pallial sinus extending to about midway between anterior adductor scar and vertical from umbo, curving backwards to join pallial line at about vertical from umbo.

Cream or pinkish, with dull violaceous radial streaks, which also show internally; one shell (S. Afr. Mus.) pure white.

About 18 × 14·5 (Krauss); 15·5 × 11·5 mm. (Sowerby); 23 × 17 mm. (S. Afr. Mus.).

Fossil: Pleistocene, Port Elizabeth (Schwarz, 1910).

Coast of Natal (Krauss); Durban (Sowerby; also S. Afr. Mus.); Kosi Bay (U.C.T.); Delagoa Bay (S. Afr. Mus. coll. K.H.B.); Inhambane (U.C.T.).

Remarks. It seems strange that Sowerby described *queketti* without recognizing *ludwigii*, and that Tomlin when identifying South African Museum material should have chosen the former name.

Named after Baron von Ludwig, a Cape Town naturalist and horticulturist in the beginning of the 19th century; and Mr. J. F. Quekett, curator of the Durban Museum (1895–1910).

Tomlin (1926, p. 301) recorded a shell from Durban as doubtfully *yemenensis* Melvill 1898. The doubt was probably due to Melvill's omission to describe the hinge-teeth. The Durban shell agreed with the Aden species in colour, but Tomlin did not state which of the three colours (white, pink, flesh) given by Melvill. The shell was probably a *ludwigii*.

Tellina regularis Smith

Tellina regularis Smith, 1904a, p. 39, pl. 3, fig. 8; Turton, 1932, p. 248, pl. 66, no. 1749.

Oval, inequilateral, postero-dorsal margin steeper and shorter than antero-dorsal margin; very fine close-set subcostulate growth-lines, not decreasing in number posteriorly, microscopic radial striae sometimes visible in the substance of the shell. Right valve with 2 cardinals, posterior bifid, anterior lateral near the cardinals, posterior lateral feeble, left valve with 2 cardinals, anterior bifid, no laterals. Pallial sinus not extending to anterior adductor scar, anterior border curving slightly backwards to join pallial line at vertical from upper corner of anterior adductor scar.

White, semipellucid, sometimes yellowish towards the umbones.

Length 14, alt. 10, thickness (valves together) 4·5 mm. (Smith).

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Port Alfred (Smith, Bartsch, Turton); Port Elizabeth and Jeffreys Bay (coll. Kilburn, seen by me); Still Bay, living and valves (S. Afr. Mus. coll. Muir).

Remarks. Deeper, more broadly oval and less acuminate posteriorly than *gilchristi*, especially juveniles of the latter.

Tellina ponsonbyi Sow.

Tellina ponsonbyi Sowerby, 1889b, p. 155, pl. 3, fig. 1; 1892, p. 56, pl. 2, fig. 58; Turton, 1932, p. 248, pl. 66, no. 1745.
Tellina rietensis Turton, 1932, p. 248, pl. 66, no. 1747.
Tellina kraussi Turton, 1932, p. 248, pl. 66, no. 1748.

Numerous fine radial pliculae crossed by slightly costulate growth-lines, forming a cancellate sculpture. Dentiform lateral teeth well developed, cardinals rather weak. Pallial sinus extending beyond the vertical from umbo, its lower border not fusing with pallial line except at posterior end.

Length 31, alt. 26 mm. (S. Afr. Mus.); also 33·5 × 27·5 mm.

Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Durban (Kilburn, 1961).

Off O'Neil Peak (Zululand), 90 fathoms, one worn valve; off Tugela River, 14 fathoms, one living, 9 valves; off Cove Rock (East London), 22 fathoms, one valve; off Keiskamma Point, 33 fathoms, one valve; Algoa Bay, 52 fathoms, 2 valves (S. Afr. Mus. P.F. coll.). Mossel Bay, living (U.C.T.).

Remarks. The concentric costulae are often sublamellate on the anterior and especially the posterior areas. Sometimes there is a distinct resemblance to the sculpturing of *Gastrana abildgaardiana*, but the two species are easily separated by the hinge.

The change in shape from markedly oval to less oval (e.g. from 6 × 4 mm. to 18 × 15·5 mm.) is well shown by the growth-lines in examples from the mangrove swamps in Durban Bay.

The large 31 × 26 mm. valve came from Algoa Bay; the largest I have seen (33·5 × 27·5 mm.) was in a private collection.

Tellina (*Angulus*) *immaculata* Phil.

Tellina immaculata Philippi, 1849, p. 55, pl. 5, fig. 2.

Thin, compressed, equivalve, without flexure, inequilateral, oval, posterior margin slightly obliquely truncate, internally a rib from umbo to postero-ventral corner (in front of posterior adductor scar) with a feebler one in front of it. Fine concentric growth-lines. Two cardinal teeth, the posterior in the right, anterior in the left valve bifid, a dentiform anterior lateral near the cardinals in right valve. Pallial sinus extending nearly to anterior adductor scar, curving slightly backwards to join pallial line at vertical from upper end of anterior adductor scar.

Rose-pink, 2 whitish radial streaks posteriorly, the hinder one corresponding with the internal ribs.

Length 27, alt. 18·5, thickness (valves together) 4 mm.

Chinde, mouth of the Zambezi River; and Delagoa Bay; low tide (S. Afr. Mus. coll. K.H.B.).

Remarks. Identified by Tomlin. Not hitherto recorded from east coast of Africa south of 15° S. latitude; but probably the same as *opalina* Chemn. recorded by Smith (1877, *Proc. Zool. Soc. Lond.*, p. 720) from Quelimane.

Hanley in Sowerby (1846, p. 295, pl. 59, fig. 124, pl. 62, fig. 197) considered that *opalina* Chemn. Schröter was the white variety of *planissima* Anton 1839 from the Moluccas. Dautzenberg (1929) recorded *opalina* (with *planissima* as synonym) from Madagascar. Tomlin's identification is accepted; I am not in a position to decide the status of *immaculata*.

Tellina (*Scissulina*) *dispar* Conrad

Tellina dispar Conrad, 1837, p. 259; Hanley in Sowerby, 1846, p. 306, pl. 59, figs. 108, 113, 114; Sowerby, 1897, p. 22.
Tellina fabula (*non* Gmelin), Krauss, 1848, p. 3; Turton, 1932, p. 248, pl. 67, no. 1751.

Right valve with fine oblique striae except on postero-dorsal area behind the umbonal ridge; left valve smooth, with growth-lines only. Hinge as in *Macoma* (no lateral teeth); upper border of pallial sinus rising rapidly to a right-angled peak, then descending to join pallial line a short distance behind anterior adductor scar.

White, pale orange, or pink.

Length 21, alt. 14 mm.

Natal Bay (Krauss); Natal, without exact locality (Sowerby; also S. Afr. Mus.); Port Alfred (Turton).

Distribution. Querimba Island (von Martens); Madagascar, Mauritius, Indo-Pacific.

Remarks. The identification of Natal shells with an Indo-Pacific species is preferable to identifying them with a European species (*fabula*). No European material is available for comparison.

Macoma litoralis (Krss.)

Fig. 31 *d*

Tellina litoralis Krauss, 1848, p. 4, pl. 1, fig. 3; Sowerby, 1892, p. 57; Johnson, 1904, p. 11.
Tellina calcarea (*non* Chemn.), Sowerby, 1892, p. 57.
Macoma calcarea (*non* Chemn.), Schwarz, 1900, p. 61.
Macoma litoralis Smith, 1904, p. 40; Bartsch, 1915, p. 206; Turton, 1932, p. 249.
Tellina (*Macoma*) *rousi* Sowerby, 1892, p. 57, pl. 3, fig. 70; Turton, 1932, p. 249.
Macoma neptuni Turton, 1932, p. 249, pl. 57, no. 1759.
[?] *Macoma patula* Turton, 1932, p. 249, pl. 57, no. 1761.
Pinguitellina cf. *culter* Day & Morgans, 1956, p. 307.

Hinge and cardinal teeth relatively strong. Upper border of pallial sinus extending to anterior adductor scar, lower border fused with pallial line. Periostracum, thin, pale brown, fawn, or pinkish.

Length 29, alt. 22·5 mm.; said to reach 35 mm. long (Smith). Type of *rousi* 35 × 25 × (valves together) 12·5 mm.

Fossil: Pleistocene, Port Elizabeth (Johnson); Keurbooms River (Schwarz).

'Cape and Natal' (Krauss); Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Keurbooms River estuary, living (S. Afr. Mus. coll. K.H.B.); Still Bay (S. Afr. Mus. coll. Muir); Delagoa Bay (S. Afr. Mus. coll. K.H.B.).

Off Cape St. Blaize, 44 fathoms, 2 valves; Buffalo Rivery estuary (East London) low tide, 3 living (S. Afr. Mus. P.F. coll.).

Bushmans River mouth, Umkomaas (Natal), Durban Bay, Richards Bay, St. Lucia Bay, and Inhambane (U.C.T.).

Estuaries of several rivers between East London and Port St. Johns (Inland Fisheries, Cape Province).

Type of *rousi* Sow. in McGregor Museum, Kimberley.

Remarks. Thanks to the Director of the Museum at Kimberley I have been able to examine the Type of *rousi*; it is not specifically distinct from *litoralis*.

Turton's photo of *neptuni* shows the pallial sinus reaching to the anterior adductor scar, and also the rather strong hinge-teeth; but in the photo of *patula* the extent of the sinus is not clear; nevertheless *patula* is probably only a *litoralis* of slightly different shape.

Variation

While collecting in the Morumbene estuary, Inhambane, Prof. Day and his assistants noticed two forms of this bivalve externally indistinguishable except that one had a short, the other a long ligament.

Further examination of these shells shows that a long ligament seems to be correlated with a narrow gap between the end of the pallial sinus and the adductor scar (see dotted line in fig. 31 *d*). Also the anterior lateral lamella in the right valve tends to develop a denticle.

In the short-ligament form the ligament extends backwards to about midway between the umbo and the vertical from anterior edge of posterior adductor scar. In the long-ligament form it extends to the vertical from the scar or slightly farther. The difference is not great but immediately noticeable when examples are placed side by side.

On beach valves the extent of the ligament is not determinable with certainty. But in a series of 60 valves collected by Dr. Muir at Still Bay about 37 have the pallial sinus extending to the adductor scar, and about 23 have a narrow gap between the sinus and the scar (some valves do not show the difference very clearly). The difference occurs in both right and left valves. The gap may be very narrow, and in some valves the end of the sinus just touches the lower corner of the scar.

From Prof. Day's experience, and Dr. Muir's collecting, the two forms occur together. Much more material, collected alive, should be examined.

Inhambane, living (U.C.T.). Bazarute Island, one living (S. Afr. Mus. coll. E. K. Jordan).

Also 3 valves from Durban North bridge, 60 ft. below sea level (Geol. Survey) appear to belong here, though the altitude is somewhat less proportionately to the length: 32 × 22, 28 × 20, and 24 × 16 mm. The smallest valve is a right valve and has a distinct denticle on the anterior lateral lamella.

It is debatable whether this species should not be returned to *Tellina* where Krauss originally placed it.

Macoma ordinaria Sow.

Fig. 31 *e*

Tellina (*Macoma*) *ordinaria* Sowerby, 1904, p. 14, pl. 7, fig. 7.

Pallial sinus reaching to midway between anterior adductor scar and vertical from umbo, its lower border uniting with pallial line at vertical from umbo. Hinge and cardinal teeth relatively weak. Periostracum thin, pale fawn. Beach valves may be yellowish internally.

Length 24, alt. 18 mm.

Saldanha Bay, 10 fathoms (Sowerby, P.F. material).

Off Baboon Point (Saldanha Bay area), 31 fathoms, one (S. Afr. Mus. P.F. coll.).

Table Bay (S. Afr. Mus. coll. Layard, and coll. Lightfoot).

Langebaan (Saldanha Bay), St. Helena Bay, 6 fathoms, and off Lambert's Bay 10–90 fathoms; Lüderitzbucht, 9–35 metres (U.C.T.).

Cotypes in South African Museum.

Remarks. Table Bay examples, some of which were collected by Layard many years ago, were formerly named *calcarea*, but Tomlin identified them as *ordinaria*. I agree that they are indistinguishable from Saldanha Bay examples.

The description of *Macoma schultzei* Thiele 1910, from Lüderitzbucht, contains no differential characters; the pallial sinus was not described. It is larger (28 × 21 mm.) than either *ordinaria* or *crawfordi*, but would fit *litoralis*. The latter has not been found on the west coast. Probably *schultzei* is the same as the shells from Great Fish Bay identified by Jaeckel as *africana* (*v. infra*). At present it cannot be admitted to the fauna-list.

Macoma crawfordi Sow.

Fig. 31 *f*

[?] *Tellina nobilis* (*non* Hanley), von Martens, 1874, p. 122.
Tellina (*Macoma*) *crawfordi* Sowerby, 1892, p. 57, pl. 3, fig. 71; Jaeckel, 1931, p. 238; Turton, 1932, p. 249.
Tellina (*Macoma*) *cumana* (*non* Hanley), Sowerby, 1892, p. 57; Smith, 1904a, p. 25.
[?] *Tellina tenuis* (*non* da Costa), Sowerby, 1892, p. 56.
Macoma africana Sowerby, 1904, p. 14, pl. 7, fig. 8; Jaeckel, 1931, p. 238 (part: the St. Francis Bay specimens); Turton, 1932, p. 249.

Pallial sinus extending a little beyond midway between anterior adductor scar and vertical from umbo, lower border joining pallial line at vertical from umbo. Hinge line narrow. Periostracum thin, pale buff or fawn. Internally pale orange or yellow.

Length 26, alt. 20 mm.

Port Elizabeth (*cumana* and *crawfordi*) and Algoa Bay 16 fathoms (*africana*) (Sowerby). St. Francis Bay, 80 metres (Jaeckel).

Kalk Bay (False Bay) (S. Afr. Mus. coll. R. M. Lightfoot).

False Bay, 50 fathoms, 4 living, and valves; St. Francis Bay, 24–34 fathoms, one; off Cape Infanta, 45 fathoms, one living; Algoa Bay, 10–31 fathoms, several living and many valves; off Kowie, 40 fathoms, several living; off East London, 32 fathoms, 2 living, one valve (S. Afr. Mus. P.F. coll.). Off Cape Barracouda, 50 metres, 5 living (S. Afr. Mus.).

False Bay; Algoa Bay, 15–17 fathoms, off East London, 30 fathoms (U.C.T.).

Remarks. Sowerby remarked on the narrow hinge in his descriptions of both *crawfordi* and *africana*. The former was based on beach material, the latter on dredged material.

Jaeckel had shells from St. Francis Bay, and managed to distinguish two species.

I do not accept Jaeckel's record of *africana* from Great Fish Bay, Angola; the shells were more likely either *ordinaria* or *cumana*, if these can be distinguished. In fact it is questionable whether *crawfordi* (*africana*) should be distinguished from *ordinaria*, but in the present material the shells from the south coast are less high proportionately than those from the west coast. The extent of the pallial sinus is the same in both.

Macoma levior Sow.

Fig. 31 *h*

Tellina (*Macoma*) *levior* Sowerby, 1904, p. 13, pl. 7, fig. 6.

Pallial sinus extending to about midway between anterior adductor scar and vertical from umbo, lower border meeting pallial line at vertical from umbo. Hinge-line narrow. Periostracum very thin, cream, more or less discoloured by adherent mud around the margin.

Length 19, alt. 15–16 mm.

Off Amatikulu River (Zululand), 26 fathoms; off Tugela River, 25 fathoms (Sowerby, P.F. material).

Same localities, several living and valves (S. Afr. Mus. P.F. coll.).

Off Umkomaas (Natal); 29° 53′ S., 31° 06′ E., 71 metres; 31° 38′ S., 29° 34′ E., 26 fathoms (U.C.T.). Inhambane (U.C.T.).

Cotypes in South African Museum.

Remarks. Very like *ordinaria*, but there is an obscure umbonal ridge which causes a slight angle at the margin.

Macoma retrorsa Sow.

Fig. 31 *g*

Tellina (*Macoma*) *retrorsa* Sowerby in Reeve, 1867, fig. 234; Smith, 1901, p. 116.
Tellina (*Macoma*) *candidata* Sowerby, 1894, p. 375; 1897, p. 23, pl. 6, fig. 25; Turton, 1932, p. 250.

Length 16, alt. 12 mm. (Sowerby). Turton gave length 20 mm.

Durban (Sowerby, Smith). Port Alfred (Turton).

Off Amatikulu River (Zululand), 24 fathoms, one living (S. Afr. Mus. P.F. coll.).

Delagoa Bay, living (S. Afr. Mus. coll. K.H.B.); Inhambane, living (U.C.T.); Beira (S. Afr. Mus. coll. D. Dods).

Remarks. Jaeckel assigned, with doubt, 2 examples from 35° 9′ S., 18° 33′ E., 564 metres, to *candidata*, agreeing with Sowerby's description but with a *Tellina* hinge. He apparently did not know Smith's 1901 paper.

Macoma inclinata Sow.

Fig. 31 *i*

Tellina (*Macoma*) *inclinata* Sowerby, 1904, p. 14, pl. 7, fig. 9.

Elongate-oval, hind margin slightly flexuose. Pallial sinus extending to midway between anterior adductor scar and vertical from umbo, lower border meeting pallial line at vertical from umbo. Hinge line narrow.

Length 33, alt. 19 mm.

Fossil: Pleistocene, Durban (Geol. Survey).

Off Tugela River, 27 fathoms (Sowerby, P.F. material).

Same locality, 46–55 fathoms, 3 living (S. Afr. Mus. P.F. coll.).

31° 41′ S., 29° 33′ E. (off Port St. Johns), 90 metres, 3 juv., living (U.C.T.).

† *Macoma chakeënsis* Cox

Macoma chakeënsis Cox, 1927, p. 59, pl. 8, figs. 9, 10.

Large, rather solid, oval, outer surface with growth-lines only; lower border of pallial sinus meeting pallial line at vertical from umbo. 68 × 47 mm.

Fossil: Lower Miocene, Pemba Island (Cox).

Durban harbour sediments, numerous examples (Dr. Lester King, 1963).

Remarks. An interesting discovery. It was not found in the Inhambane deposits (Cox, 1939), and has not been found in any other locality, fossil or living. Some of the present specimens appear quite fresh.

The occurrence of this Miocene fossil in the Durban harbour sediments is no indication that all, or any of these deposits date back to the Miocene. The question of their age will be discussed by Dr. Lester King; here only the locality is recorded.

Apolymetis orbicularis (Sow.)

Tellina orbicularis Sowerby, 1889a, p. 13, pl. 1, fig. 20; 1892, p. 57, pl. 3, fig. 64.
Tellina umbonella (*non* Lam.), Sowerby, 1892, p. 57.
Macoma orbicularis (Sow.), Newton, 1913, p. 341, pl. 18, fig. 5.
Metis orbicularis (Sow.), Bartsch, 1915, 206; Turton, 1932, p. 249.

Length 63, alt. 53 mm. (Newton: fossil); 50 × 45 mm. (Sowerby); worn valves 66 × 55, 52 × 46, 41 × 33, and 29 × 22 mm. (S. Afr. Mus.).

The more oval-oblong shape of the 29 and 41 mm. long valves conforms with the growth-lines on the larger valve at corresponding sizes. Cf. also Sowerby's figure.

Fossil: Pleistocene, Redhouse, Port Elizabeth (Newton); Sedgefield near Knysna (A. R. H. Martin); Knysna raised beach (S. Afr. Mus.); Little Brak River (S. Afr. Mus.).

Port Elizabeth (Sowerby); Port Alfred (Bartsch, Turton); Mossel Bay (Dr. H. Ackert); Still Bay (S. Afr. Mus. coll. Muir); False Bay (Mrs. Connolly).

Cape Point S.W. W. ¾ W. 3½ miles (False Bay), 32 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Remarks. A rare species. The original specimen came from Port Elizabeth; Turton found 2 valves; Dr. Muir found 3 valves; the P.F. took only one half-grown valve.

Sowerby (1889) did not compare this species with any other, nor did Newton (1913). But comparison might be made with the Red Sea fossil *papyracea* Gmelin (*lacunosa* Chemn.); see: Sowerby, 1846, pl. 65, fig. 252; Nardini, 1937, pl. 18(12), fig. 18.

Gastrana abildgaardiana (Spengler)

Tellina abildgaardiana Spengler, 1798, p. 90.
Gastrana abildgaardiana (Speng.), Schwarz, 1900, p. 61; Johnson, 1904, p. 11; Schwarz, 1910, p. 116; Haughton, 1932, p. 38; Macnae & Kalk, 1958, p. 129; Franca, 1960, p. 99, pl. 29, fig. 1.
Petricola ventricosa Krauss, 1848, p. 2, pl. 1, fig. 1.

Shape normally ovate, broadly rounded in front, somewhat acuminate behind, longer than high; but the proportions may vary, and examples with indented margin or otherwise distorted may occur (see below).

Length 43, alt. 33 mm.; also 44 × 31, 31 × 23, 29 × 25, 21 × 17, 21 × 15, 20 × 13, 18 × 14 mm. Valves together: 35 × 26 × 18, 36 × 24 × 15·5, 27 × 20 × 14, and 18 × 12 × 8 mm.

Fossil: Pleistocene, Saldanha Bay (Haughton); Klein River, Stanford (S. Afr. Mus.); raised beach Still Bay (S. Afr. Mus.); Sedgefield near Knysna (A. R. H. Martin); Knysna and Keurbooms River (Schwarz); Port Elizabeth (Schwarz, Johnson).

Dunes near Zoetendal Vlei (Bredasdorp Division) (Krauss); Still Bay (S. Afr. Mus.); Keurbooms River estuary (S. Afr. Mus. coll. K.H.B.); Port Elizabeth (Sowerby; also S. Afr. Mus.); Port Alfred (Smith, Bartsch, Turton); Natal (Krauss); Durban (S. Afr. Mus.; also U.C.T.); Delagoa Bay (S. Afr. Mus. coll. K.H.B.; also U.W.; also Franca).

Off Tongaat (north of Durban), 36 fathoms, one valve; off Tugela River, 65–80 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Distribution. Karachi (Melvill & Standen).

Remarks. A small globose example, 10 × 9 × 7 mm., was found wedged in a crevice in coral at Delagoa Bay, and also a single valve, 12 × 10 mm., with an indent in the ventral margin (K.H.B. 1912).

G. matadoa (Gmelin) (*guinaica* Chemn.) (1846, Hanley in Sowerby, p. 320, pl. 59, fig. 130) occurs on the west coast of Africa (Mauritania, Senegal), and *G. suarezensis* Bertin at Madagascar.

Without material for comparison, I cannot say whether the Saldanha Bay fossil shells should be assigned to the West African *matadoa* or to *abildgaardiana*, presuming there is a specific difference. Melvill & Standen (1906) recorded '*guinaica* Chemn. = *abildgaardiana* Spengler.'

Fam. **Solenidae**

Solen capensis Fischer

Fig. 32 *a*, *b*

Solen marginatus Koch (*non* Pult.), Krauss, 1848, p. 1; Sowerby, 1892, p. 54; Schwarz, 1900, p. 61; Johnson, 1904, p. 11; Schwarz, 1910, p. 116.

Solen capensis Fischer, 1881, p. 155 (*nom. nov.* for *marginatus* Koch, *non* Pulteney); Haughton, 1932, p. 38; Scott, Harrison, Macnae, 1952, p. 310; Day, Millard, Harrison, 1952, pp. 393, 394, 410.

Solen alfredensis Bartsch, 1915, p. 208, pl. 40, figs. 1, 2; Turton, 1932, p. 254.

Anterior margin exsert, causing a definite groove which extends in half-grown and adult shells from dorsal to ventral margin; in large shells the anterior margin is thickened and shows growth-lines. Anterior adductor scar nearly as long as ligament.

Length 158, alt. 22 mm. (Still Bay); also 150 × 21 mm. (Keurbooms River).

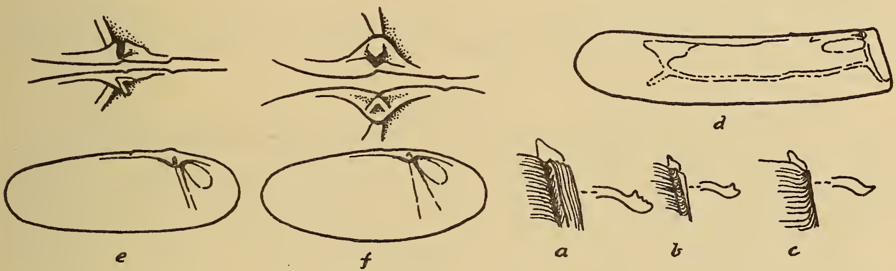

Fig. 32. *a*, *b*, *Solen capensis* Fischer, anterior end of adult and juvenile to show groove. *c*, *S. corneus* Lam., or *gouldi* Conrad, anterior end without groove. *d*, *Solen* sp. St. Lucia Bay, internal view. *e*, *Siliqua polita* (Wood), internal view, with hinge above. *f*, *S. radiata* (Linn.) the same.

Fossil: Pleistocene, Bogenfels, South West Africa, Saldanha Bay (Haughton); Sedgefield near Knysna (A. R. H. Martin); Keurbooms River (Schwarz); Port Elizabeth (Johnson, Schwarz).

Kromme River mouth (Krauss); Port Elizabeth (Sowerby); Port Alfred (Smith, Bartsch, Turton); Jeffreys Bay (S. Afr. Mus.); Keurbooms River estuary (S. Afr. Mus. coll. K.H.B.); Still Bay (S. Afr. Mus. coll. Muir); East London (S. Afr. Mus.). Riet Vlei estuary, Table Bay (S. Afr. Mus. coll. K.H.B.).

Off Nanquas Peak (east end of Algoa Bay) 49 fathoms, one broken valve (S. Afr. Mus. P.F. coll.).

West coast: Olifants River mouth; Milnerton lagoon, Table Bay; south coast: Klein River estuary, Hermanus; Knysna lagoon; Sundays River mouth; Bushmans River mouth; Hamburg; Port St. Johns (U.C.T.).

Estuaries of several rivers between Keiskamma River and Port St. Johns (Inland Fisheries, Cape Province).

Remarks. The smallest valve in a series from one locality (Still Bay) is 49 mm. long. The groove is distinct. The next smaller valve is one 36 mm. long from Mossel Bay; this has a shallow groove dorsally, none ventrally, and the anterior margin is exsert dorsally (i.e. projecting perpendicularly to the shell surface) but projecting forwards (porrect) ventrally. This Mossel Bay specimen was identified by Tomlin as *corneus*; an identification which I am disinclined to accept. A study of very young shells should be made, and their growth traced up to the half-grown shells.

Krauss gave the locality 'mouth of the Kromme River in Uitenhage District'. In those days the confines of the 'Districts' were larger than those of the present day 'Divisions'; presumably Krauss's locality is the Kromme River flowing into St. Francis Bay in the Humansdorp Division.

Solen gouldi Conrad

Fig. 32 *c*

Solen gouldi Conrad, 1862, p. 26; Sowerby, 1892, p. 54; Day & Morgans, 1956, p. 308; Macnae & Kalk, 1958, p. 129.

Anterior margin not exsert, no definite groove at anterior end. Anterior adductor scar nearly as long as ligament.

Length 70, alt. 11 mm.

Port Elizabeth (Sowerby; also, living, S. Afr. Mus.); Kowie, living (S. Afr. Mus.); East London, living (S. Afr. Mus. P.F. coll.); Durban Bay, living (U.C.T.); Umlalazi, near Richards Bay (U.C.T.); Delagoa Bay (U.W.); Inhambane and Maxixe (Machiche) (U.C.T.); Mozambique Island (U.W.).

Off Umhlanga (Natal), 22–26 fathoms, one broken valve; off Tugela River, 37 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Japan.

Remarks. The P.F. example from East London was identified by Sowerby as *gouldi*. Without material for comparison I am fain to accept this identification; and the above specimens are recorded provisionally as *gouldi*, though perhaps they are more probably *corneus* Lam., which Sowerby (1897) recorded from Durban, and Smith & Bloomer (1906) from Zanzibar.

Solen roseomaculatus Pilsbry

Solen roseomaculatus Pilsbry, 1901b, p. 399, pl. 19, fig. 13; Jaeckel, 1931, p. 240; Kira, 1955, pl. 61, fig. 4; Macnae & Kalk, 1958, p. 129.

Slightly curved, roseomaculate, 31 × 6·3 × 3·8 mm. (ex Pilsbry). The Inhambane specimen measures 25 × 5 mm., is roseomaculate, slightly curved, with truncate posterior margin. The anterior adductor scar is as long as the anterior margin (4 mm.) and as long as (or a trifle longer than) the ligament.

Delagoa Bay (U.W.); Inhambane (U.C.T.).

Distribution. Japan (Pilsbry); off Dar-es-Salaam, 50 metres (Jaeckel).

Remarks. This Japanese species having been found off the coast of East Africa, its occurrence farther south is not unlikely.

Pilsbry described the hinge-teeth, but did not mention the anterior adductor scar. His figure showed the posterior margin truncate.

The following specimen appears to be closely allied.

Solen sp.

Fig. 32 *d*

Slightly curved, anterior margin straight, posterior margin rounded; anterior margin exsert, causing a slight groove, but only on the dorsal half (? juvenile); anterior adductor scar only about ⅔ length of ligament, oval, 3½ times as long as broad; posterior adductor scar triangular; a single cardinal tooth in both valves; in left valve a slight projection behind the cardinal, which may be a lateral tooth or merely an accidental crack in the shell.

Uniform corneous. Length 23, alt. 5, thickness (valves together) 4 mm.

St. Lucia Bay (U.C.T.).

Remarks. Resembles *roseomaculatus* in being slightly curved. This feature and the shortness of the anterior adductor scar distinguishes this single specimen from the other examples of *Solen* in the present material.

Pharus sp.

Straight, rounded at both ends, altitude greater posteriorly than at umbo, which is 5·5 mm. from anterior end. Hinge with 2 teeth in right valve, 3 in left, the posterior one of the latter bifid. Ligament 6–7 mm. long. No internal ridges. Anterior adductor scar elongate (7 mm.), somewhat dumbbell-shaped, the anterior part subcircular, posterior part oval. Posterior adductor triangular. Lower broder of pallial sinus mostly fused with pallial line. Periostracum yellowish-brown.

Siphons short, united except at very end. Foot apically obliquely truncate. Mantle edge fringed anteriorly, dorsally and ventrally. Gills smooth.

Length 35, alt. (at umbo) 8·5, (greatest) 10·5 mm.

28° 46′ S., 16° 27′ E., 38–42 metres (s.s. *Africana*, per U.C.T.).

Appears to be a species of *Pharus*, but differs from *legumen* by the forward position of umbo, rounded hind end, and absence of internal thickenings. Shape resembling *Solen gaudichaudi* as figured by Chenu (1862, fig. 92).

Phaxas pellucidus (Pennant)

Solen pellucidus Pennant, 1777, p. 71.
Cultellus pellucidus (Penn.), Sowerby, 1892, p. 54; Jaeckel, 1931, p. 240.
Cultellus decipiens Smith, 1904a, p. 39; Turton, 1932, p. 254, pl. 69, no. 1798.

White or cream, with corneous periostracum, darker in large specimens than in juveniles.

Length 57, alt. 15–16 mm.

Port Elizabeth (Sowerby); Port Alfred (Smith, Turton); Lüderitzbucht (Thiele 1910); Table Bay (S. Afr. Mus.); Algoa Bay (Jaeckel); mouth of Kaffirkuils River, Still Bay (S. Afr. Mus. coll. Muir).

False Bay, 22–30 fathoms, 4 living; off Cape St. Blaize, 37 fathoms, one living; Algoa Bay, 22–31 fathoms, 4 living (S. Afr. Mus. P.F. coll.).

Saldanha Bay; off Hout Bay (west side of Cape Peninsula), 41 fathoms; False Bay; off Port St. Johns, 26 fathoms (U.C.T.).

Distribution. Europe.

Remarks. The P.F. examples do not exceed 30 mm. in length; Dr. Muir obtained one 46 mm.; the largest were obtained on Woodstock beach, Table Bay by R. M. Lightfoot.

It seems doubtful whether *decipiens* can be maintained, but I have no European material for comparison.

Phaxas cultellus (Linn.)

Cultellus cultellus (Linn.), Chenu, 1862, fig. 98.
Cultellus (*Ensiculus*) *cultellus* (Linn.), Lynge, 1909, p. 276.
Cultellus (*Cultellus*) *cultellus* (Linn.), Prashad, 1932, p. 312.
Phaxas cultellus (Linn.), Gravely, 1941, p. 63, fig. 23 *a*.
[?] *Cultellus pellucidus* (*non* Penn.), Macnae & Kalk, 1958, p. 129.

Slightly curved, ventral margin more convex than dorsal margin. Anterior adductor scar elongate. One narrow cardinal tooth in right valve fitting between two in left valve, posterior lateral tooth lamellate, with dentiform projection, especially in left valve; anterior lateral more or less dentiform, above the anterior end of adductor scar.

More or less mottled with purplish-brown.

Length 70, alt. 18 mm.

Off Tongaat, Morewood Cove, and Umhloti (Natal), 25–40 fathoms, one juv. living, several valves, more or less broken (S. Afr. Mus. P.F. coll.).

Mozambique Island (S. Afr. Mus. coll. K.H.B.).

? Delagoa Bay (U.W.).

Distribution. Red Sea, Madagascar, India, East Indies, Philippines, China, Japan.

Remarks. The P.F. juvenile and one of the valves were identified by Sowerby.

Siliqua polita (Wood)

Fig. 32 *e*

Solen polita Wood, 1828, p. 3, pl. 1, fig. 6 [*n.* et *f.* only, *teste* Sherborn]; Sowerby, 1902, p. 100; Macnae & Kalk, 1958, p. 129.
Siliqua japonica Sowerby, 1892, p. 54.

Oblong, dorsal and ventral margins nearly straight and subparallel. Anterior arm of the Λ-shaped cardinal tooth in right valve fitting between 2 prominent cardinals in left valve, posterior arm in right valve and the corresponding groove in left valve weak. Internal rib narrow, not widening ventrally.

Pale greyish, periostracum with a more orange zone around the margin.

Length 30, alt. 11 mm.

Port Elizabeth (Sowerby).

Off Amatikulu River (Zululand), 24 fathoms (Sowerby, P.F. material); off Tugela River, 12–14 fathoms, 2 living, one valve (S. Afr. Mus. P.F. coll.).

Delagoa Bay (U.W.).

Distribution. Red Sea, Japan.

Remarks. The locality Port Elizabeth, even for dead shells washed ashore, seems unlikely. Sowerby did not return the Zululand specimens; but returned those described above, with the label 'Siliqua sp.'. Presumably they are conspecific.

Sowerby (1902) regarded *polita* and *japonica* as synonymous. Kira's (1955, pl. 61, fig. 12) figure of *japonica* Dnkr. is coloured as in *radiata*, but is too small to show the shape properly. Gravely (1941, p. 63) refers to a species 'parallel-sided with broadly rounded ends and very pale which may possibly be *S. albida*'.

Siliqua radiata (Linn.)

Fig. 32*f*

Siliqua radiata (Linn.), H. & A. Adams, 1855/56, p. 345, pl. 93, figs. 3, 3*a*; Lynge, 1909, p. 277; Gravely, 1941, p. 62, fig. 23 *c*.
Machaera radiata (Linn.), Chenu, 1862, fig. 102.

Oval, dorsal and ventral margins convex. The Λ-shaped cardinal tooth in right valve fitting into a V-shaped groove between the 3 teeth in left valve. Internal rib widening from umbo to ventral margin.

Pale fawn or fuscous, with 3 or 4 white radiating rays, the anterior one corresponding with the internal rib, the 4th (if distinct) near the postero-dorsal margin.

Length 25, alt. 10 mm.

Durban (S. Afr. Mus. coll. Burnup); Delagoa Bay (U.W.).

Off Umhloti River (Natal), 27 fathoms, 8 valves (S. Afr. Mus. A9553. P.F. coll.).

Distribution. India, East Indies, Siam.

Remarks. Differs from the preceding species in shape, hinge-teeth, internal rib, and coloration.

Without material for comparison, these specimens are provisionally assigned to *radiata*. The outline does not quite conform with that in any of the above quoted figures, the postero-dorsal margin being more sloping and the shape more evenly oval.

Fam. **Saxicavidae**

In 1861 Gould described *S. flaccida* from Hong Kong and Simon's Bay, admitting he was uncertain whether the shells from the two localities were specifically the same. He mentioned the post-umbonal ridges as being sometimes spinulose. It seems highly probable that he had some specimens of *arctica* from Simon's Bay; and so far as concerns the South African fauna-list, *flaccida* should be regarded as a *species delenda*.

S. arctica and *rugosa* have been considered synonymous, the former being more free-living individuals, the latter boring into rocks. The larval development, however, seems to show that they are distinct species (Lebour, 1938, pp. 138, 139, fig. 5 *a–q*).

Saxicava arctica (Linn.)

Saxicava arctica (Linn.), Krauss, 1848, p. 2; Jaeckel, 1931, p. 241.

Two squamiferous ridges radiating from umbo to posterior margin; these are visible on unworn shells at the 1 mm. stage. The squmae vary in size, sometimes long and almost spiniform, e.g. on a 7 mm. shell from Browne's Bank some of the squamae near the margin are 1·5 mm. long.

The largest P.F. shell is 20 × 10 mm. Periostracum rusty-brown.

Knysna (Krauss); Port Elizabeth (Sowerby); Port Alfred (Turton). Algoa Bay and Agulhas Bank, 80–155 metres (Jaeckel).

34° 41′ S., 18° 36′ E., 98 fathoms; 35° 4′ S., 18° 37′ E., 150 fathoms (Smith, 1885).

From East London to Algoa Bay, Agulhas Bank (incl. Browne's Bank approx. 36½ S., 21¼ E.) to False Bay, off Cape Point, west side of Cape Peninsula to Table Bay, 30–150 fathoms, living and valves (S. Afr. Mus. P.F. coll.).

34° 59′ S., 22° 18′ E., 58 fathoms; 34° 48′ S., 22° 06′ E., 55 fathoms; 34° 11′ S., 18° 20′ E., 15 fathoms (U.C.T.).

Distribution. Europe, Canaries, Azores, Mauritania, St. Helena, Marion and Prince Edward Islands, Kerguelen. Also west coast of North America, Japan, Australia.

Remarks. Dead valves are frequent in most of the P.F. bottom samples from the Agulhas Bank.

Krauss found his specimens in the hollow scales on *Pinna squamifera.*

Saxicava rugosa (Linn.)

Saxicava rugosa (Linn.), H. & A. Adams, 1855/56, p. 349, pl. 94, figs. 1 *a*, *b*.
Saxicava australis (*non* Lam.), Sowerby, 1892, p. 55.

Less rectangular than *arctica*, and both radiating ridges weaker, especially the one near the dorsal margin, and without squamae.

14 × 8 mm. (shell without extension of periostracum) (S. Afr. Mus.).

South Africa (Sowerby); Still Bay (S. Afr. Mus. coll. Muir); False Bay 11 fathoms, one living (S. Afr. Mus. P.F. coll.); False Bay, littoral (U.C.T.).

Distribution. Europe.

Sowerby said 'The specimens shown me from South Africa look very much like the British *S. rugosa*', but he recorded them as *australis.* Any doubt these words might imply as to provenance of the specimens is dispelled by finding examples in False Bay. These look very much like *rugosa.*

The Muir collection contains a series from 1·5 mm. up to 7 mm. long. None of these shows any trace of squamae; the three largest are considerably distorted.

Saxicava sp.

Fig. 33 *a*

A single valve, rather like a plough-share in shape, may possibly be a *rugosa* slightly distorted. It is, however, sufficiently distinct to merit a figure.

Length 6, alt. 3 mm.

Simon's Bay (False Bay), 22 fathoms (S. Afr. Mus. A9554. P.F. coll.).

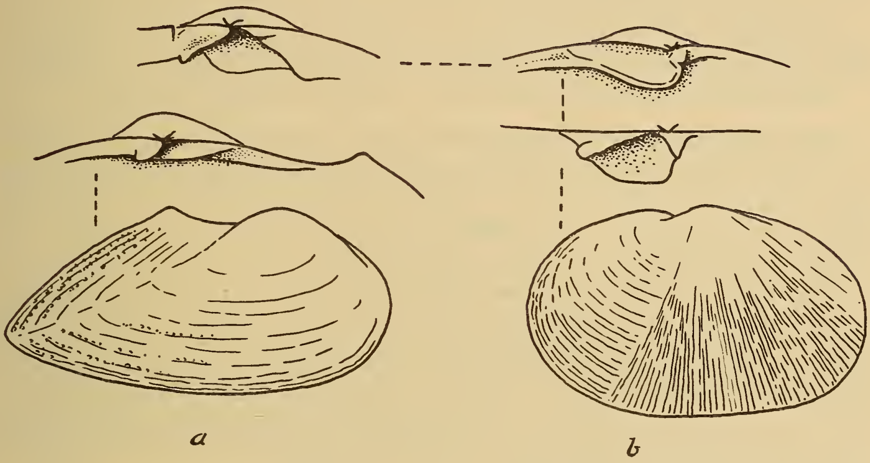

Fig. 33. *a*, *Saxicava* sp. (S. Afr. Mus. No. A9554), with hinge. *b*, *Cryptomya philippinarum* (A. Adams) from Sedgefield deposits, external view, hinges of left and right valves, dorsal view of former with projecting ligament pit.

Gen. Panopea Ménard

Ménard, 1807, p. 135.

Panopea aldrovandi Ménard

Panopea aldrovandi Ménard, 1807, p. 136; Nicklès, 1950, p. 228, fig. 444; Franca, 1960, p. 37.
Panopaea australis non Sow., Valenciennes, 1839, p. 1. [Not in Sherborn, Ind. Anim; quoted by H. C. and R. Winckworth, 1935]; Chenu, 1843–53, pl. 8, figs. 1–9 [quoted from Smith, 1903].
Panopaea aldrovandi Lam., Woodward, 1856, p. 218, text-fig. (anatomy).
Panopaea aldrovandi Ménard, Dautzenberg, 1910, p. 148; 1912, p. 99.
Glycimeris rugosa Bosc, H. & A. Adams, 1855, pl. 94, figs. 2–2*b*; 1856, p. 350.
Panopaea natalensis Woodward, 1856, p. 220; Smith in Rogers, 1906, p. 294; Schwarz, 1910, p. 115.
Panopea natalensis Woodward, Smith, 1903a, p. 399; Barnard, 1962b, p. 187.
Panopea attenuata Sow., Reeve, 1873 (1874), pl. 3 [quoted from van Hoepen]; Sowerby, 1889b, p. 156.
Panopea dreyeri van Hoepen, 1940, p. 186, pls. 10, 11.

Pallial line continuous; sinus extending to vertical from hind end of ligamental ridge (or nearly as far). Growth-lines show that the anterior margin becomes increasingly more obliquely subtruncate in the half-grown to adult.

Length 204, alt. 124, thickness (valves together) 98 mm. (Hopefield); 190 × 125 × 96 and 180 × 106 × 72 (Little Brak River); 245 × 145 × (one valve) 50 mm. (Meob Bay).

Fossil: Pleistocene, Little Brak River, Mossel Bay (Smith in Rogers; van Hoepen; also S. Afr. Mus. coll. S. H. Haughton); Port Elizabeth (Schwarz). Berg River near Hopefield (S. Afr. Mus.; ? fossil).

Meob Bay, Lüderitz district (opposite Hollam's Bird Island) washed up by extra high tides (Geological Survey, and Staatsmuseum, Windhoek).

Distribution. 'Sur la côte Natal, baie des Tigres, par 16° 40′ de latitude sud', living (Valenciennes). Baia dos Tigres, and Baia de Mocamedes (Franca).

Mediterranean, Atlantic coast from Portugal to Dakar (Nicklès).

Remarks. Woodward quoted (from Forbes, who quoted from Valenciennes) an account of how Capt. Cecile* of the French frigate *Heroine* obtained these large shells in the sandy bays of 'Port Natal' [*sic*]. H. C. & R. Winckworth (1935, p. 162) gave the locality more correctly as 'Tigers' Bay in Angola', with their comment: 'Curiously said to be in Natal'.

The occurrence of a *Panopea* on the Natal coast is due solely to Woodward (or Forbes) having quoted only the first part of the locality given by Valenciennes, and changed 'côte Natal' into Port Natal (= Durban). Only the second part of Valenciennes's locality is acceptable, because there is not, nor has been so far as I can discover, any Tiger Bay on the coast of Natal; whereas Tiger Bay in Angola *is* situated in 16° 40′ S. latitude.

Woodward based the name of the species on a misquoted locality!

Have any examples of *Panopea* been collected on the Natal coast, more particularly in Durban Bay? Apart from several shell collectors in Natal, Durban Bay has been dredged for harbour and scientific purposes. Neither the *Pieter Faure* nor Prof. Day's party (1956, Day & Morgans, p. 260) obtained this shell. There are no recent records, and so far as I am aware there are no specimens in existence from this locality.

Port Elizabeth is therefore the most easterly locality where *Panopea* has been obtained, and moreover only as a fossil (Stow, 1871, p. 518).

No locality was given for the single valve recorded by Sowerby (1889) under the name *attenuata*, but probably it came from the same source as the specimen(s) recorded by Stow (1871) and Schwarz (1910).

The exact locality in the Great Berg River is not recorded; the donor resided at Hopefield, on the Zout River, a tributary of the Great Berg River; but the specimen is more likely to have come from the estuary of the latter debouching into St. Helena Bay, where there are extensive mud flats and sand banks.

The specimen is bleached, but does not appear to be fossilized as are the shells from the Little Brak River deposit.

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* As spelt by Woodward. Probably the same as l'amiral Cécille, referred to by Dautzenberg (1927, p. 346). I have not been able to trace the paper by Forbes from which Woodward quoted.

Woodward said that *natalensis* was very like *aldrovandi*; and in 1962 I provisionally retained the name. But in fact there seems to be considerable resemblance between the so-called species, both fossil and living, of *Panopea*. Are there any clear-cut characters, apart from minor and inconstant differences in shape due to growth changes, which will serve to differentiate these so-called species?

Externally the South African specimens agree with Nicklès's figure of *aldrovandi*; and with Chenu's figures (1862) of *australis* and *faujasi*.

The recent discovery of specimens in South West Africa bridges the gap in the distribution of *Panopea* between southern Angola and Hopefield (Cape); and raises the expectation that specimens will be found in the gap between the former and Dakar.

For the above reasons I adopt Ménard's name for the South African specimens instead of Woodward's inappropriate and misleading name.

Fam. **Aloididae**

Aloidis Megerle 1811 replaces *Corbula* (Brug.) Lamarck 1799, *nom. preocc.* Röding 1798.

Aloidis valdiviae (Jaeckel)

Corbula rugifera A. Adams MS. in Cuming collection; Smith, 1903a, p. 99, pl. 15, figs. 9, 10 (*nom. preocc.* H. Adams).
Corbula valdiviae Jaeckel, 1931, p. 241, pl. 9(4), fig. 117.
Corbula tahitensis (*non* Lam.), Braga, 1952, p. 117.

Inequivalve, oblong, a ridge from umbo to the more or less sharply angulate postero-inferior corner. Strong and rather sharp concentric lirae, which posteriorly to the ridge are obliquely wrinkled (Smith; blätterig, Jaeckel); anteriorly and medianly fine radial striae in the sulci between the lirae, extending up the dorsal slope of the lirae to their crest, but not so far up on the ventral slope. No pallial sinus. The tooth (anterior) in the right valve much stronger than the tooth (posterior) in the left valve.

Length 15·5, alt. 9 mm. (S. Afr. Mus.); 13 × 8 × 5·5 mm. (Smith).

Umkomaas, Natal (Smith); Tongaat and Richard's Bay (S. Afr. Mus.); Inhambane (Braga).

Off Tugela River (Natal), 47 fathoms, 2 valves; off Umkomaas, 40 fathoms, 3 valves; off Hood Point (East London), 49 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Distribution. Off Dar-es-Salaam, 50 metres (Jaeckel).

Remarks. Smith made no mention of the radial striations in the sulci, but they are very distinct in the P.F. specimens, and can be faintly traced on beach-worn valves.

The identity of *valdivia* with Smith's *rugifera* is clear from Jaeckel's description and figure. Jaeckel said the species was similar to the Red Sea fossil *C. acutangula* Issel.

Comparison should also be made with *A. socialis* (Martin) (Cox, 1927,

p. 60, pl. 9, figs. 5 *a*, *b*; Nardini, 1937, p. 264, pl. 18(12), figs. 9, 10). Cox made no mention of radial striae. Nardini distinguished *socialis* from *acutangula*.

Melvill & Standen (1906, p. 843) record a *Corbula rugifera H.* Adams; presumably therefore *rugifera* Smith is preoccupied and must give place to *valdiviae*.

Aloidis tunicata (Hinds)

Corbula tunicata Hinds, 1843, p. 55; 1844, p. 68, pl. 20, figs. 4, 5.
Corbula cuneata Hinds, 1843, p. 56; 1844, p. 68, pl. 20, fig. 6.
Aloidis tunicata (Hinds), Prashad, 1932 p. 310.

Agulhas Bank, 70 fathoms (Hinds). For *tunicata* Hinds gave also Straits of Macassar; and Sowerby (1892, p. 55) said both species were common in the China sea. Neither the *Pieter Faure* nor the *Valdivia* obtained any specimens on the Agulhas Bank.

Both species are posteriorly rostrate; and it seems probable that *cuneata*, figured as being 14 × 11 mm., is only a younger shell of *tunicata*, figured as being 26 × 19 mm., though neither Smith (1885) nor Prashad suggested this.

Aloidis persica (Smith)

Corbula persica Smith, 1906a, p. 262.

Very inequivalve, right valve inflated, umbonate, with *c.* 28 strong rounded concentric lirae, intervals narrow; left valve smaller and flatter, fitting within the right valve, with concentric growth-lines only. No pallial sinus. The tooth (anterior) in right valve stronger than that (posterior) in the left valve.

White, with yellowish-brown periostracum, which is thicker on the left valve and overlaps the margin.

Right valve: length 6·75, alt. (overall) 6·75, internal (excl. umbonal projection) alt. 4·5 mm.; left valve length 5·5, alt. 4 mm.

Off East London, 36–42 fathoms, one living (S. Afr. Mus. A9555, P.F.).

Distribution. Persian Gulf, 47 fathoms (Smith); Gulf of Oman, 156 fathoms (Melvill & Standen).

Remarks. Identified by Tomlin as *persica*. Agrees also with Jaeckel's figure of *andamanica* (Smith). The latter (Smith, 1906a, p. 263) from the Andaman Islands, 100 fathoms, and from off Dar-es-Salaam 50 metres (Jaeckel, 1931, p. 242, pl. 9(4), fig. 120) (right and left valves), is so closely similar to *persica* as to be probably synonymous.

Smith stated that the left valve had a few radiating lirae; in the present specimen they seem to be absent, but except near the umbo the shell is concealed by the thick adherent periostracum.

Fam. **Myidae**

In Bartsch's (1915, p. 251) list of species 'reported from South Africa' are included *Sphenia decurtata* A. Ad., *mindorensis* (Ad. & Rve.), and *philippinarum* A. Ad. I have not discovered who reported these species from South Africa. They are not in the 'Official list' (Sowerby, Smith, Tomlin).

Cryptomya philippinarum (A. Ad.)

Fig. 33 *b*

Sphaenia philippinarum A. Adams, 1851, p. 89, pl. 10, figs. 7–9.
Cryptomya philippinarum (A. Ad.), H. & A. Adams, 1855/56, p. 358, pl. 95, figs. 5, 5*a*, *b*.

Posterior two-thirds (except postero-dorsally) with fine radiating riblets, anterior third with growth-lines only. Ligament pit in left valve sliding under the hinge in right valve.

One left valve 8·25 × 5 mm., and a broken larger right valve probably *c.* 16–17 mm. when unbroken.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

Distribution. Philippine Islands.

Remarks. The external sculpture corresponds with fig. 5*b*, and the original description which said 'posterior side striated'. The shape is more like that of figure 5, but is not so high, and with a less curved ventral margin (figs. 5 and 5*a*, *b* differ in shape). In *decurtata* the whole shell would seem, from the description, to be radiately striated. *Mya mindorensis* (Ad. & Rve. 1848, p. 82, pl. 23, fig. 13) has no sculpture.

Fam. **Gastrochaenidae**

Lamy 1925, pp. 284–319.

Gastrochaena cf. *dubia* (Pennant)

[Cf.] *Rocellaria dubia* (Penn.), H. & A. Adams, 1855/56, p. 336, pl. 91, figs. 2–2*c*.
Gastrochaena sp. Bartsch, 1915, p. 210; Barnard, 1962b, p. 187.
Gastrochaena ? *retzi* Turton, 1932, p. 258.
Gastrochaena cf. *ruppellii* Check-list Mollusca, False Bay, Mem. Conch. Soc. S. Afr., 1960, i, p. 15.

Length up to 16 mm., alt. at umbo 4, greatest alt. (posteriorly) 7 mm.

Umbo near anterior end; dorso-anterior corner rectangular. Sculptured with lines of growth only, fine but somewhat irregular in strength. Hinge-line below umbo incrassate, forming a small projecting tooth.

Fossil: Pleistocene, limestone deposit, mouth of Klein River, Stanford (S. Afr. Mus.).

False Bay (S. Afr. Mus.); also False Bay, 9–14 fathoms (S. Afr. Mus. P.F. coll.); Still Bay (S. Afr. Mus. coll. Muir); also Kalk Bay harbour (False Bay) (U.C.T.).

Port Alfred (Bartsch, Turton).

Remarks. This species is not *cuneiformis*, and certainly not *retzi* (= *Spengleria mytiloides*). It might, however, be the European and Mediterranean *dubia* (Pennant). I have no material for comparison.

The tubes of the fossil examples are about 23 mm. long (probably 25 mm. when unbroken), greatest diameter about 9, and at the aperture 5 mm. They appear to be simple tubes without extraneous objects, lining *c.* 0·5 mm. thick, slightly thicker near posterior end where there appears to be a slight constriction of the lumen, as if a septum had once been present. It is impossible to say whether the tubes lay free in soft sand, or whether the animals had bored into the consolidated sand-(lime-)stone.

Gastrochaena cuneiformis Spengler

Gastrochaena cuneiformis Speng., Chenu, 1862, fig. 73; Lamy, 1925, p. 295 (references); Dautzenberg, 1929, p. 618.
Gastrochaena cuneiformis var. *ruppellii* Lamy, 1925, p. 295.
Gastrochaena lamellosa Smith, 1885, p. 28, pl. 7, figs. 2, 2*a*, *b*.
Gastrochaena dubia (*non* Pennant), Macnae & Kalk, 1958, pp. 37, 92, 129.

Anterior end viewed laterally acuminate, viewed dorsally almost a right angle, posterior end rounded, umbo at about $\frac{1}{5}$ length from anterior end, growth-lines regular, raised, lamellate. Length 25 mm.

Inhaca Island, Delagoa Bay (U.W.).

Distribution. Red Sea, Mauritius, Bourbon, Indo-Pacific.

Fistulana sp.

Fig. 34

Cf. *F. agglutinans* Desh., 1855, p. 330; Lamy, 1925, p. 318.

One specimen collected by U.W. at Inhaca Island, Delagoa Bay.

Tube composed of agglutinated sandgrains and incorporating broken pieces of mollusc and barnacle shells. There is a hint of transverse segmentation. Length 23 mm. Aperture oval, perpendicular to the plane of the tube as here drawn, with a slight keel on each side incompletely dividing the lumen into two canals; an internal septum at *c.* 5–6 mm. from the end of the tube, with an oval perforation.

Shell 14–15 mm. long, bluntly rounded anteriorly, umbo near anterior end, a very feeble ridge from umbo to the rounded-subtruncate posterior margin, sculpture of growth-lines only.

A commensal flat-worm (Trematode ?) was found in the tube.

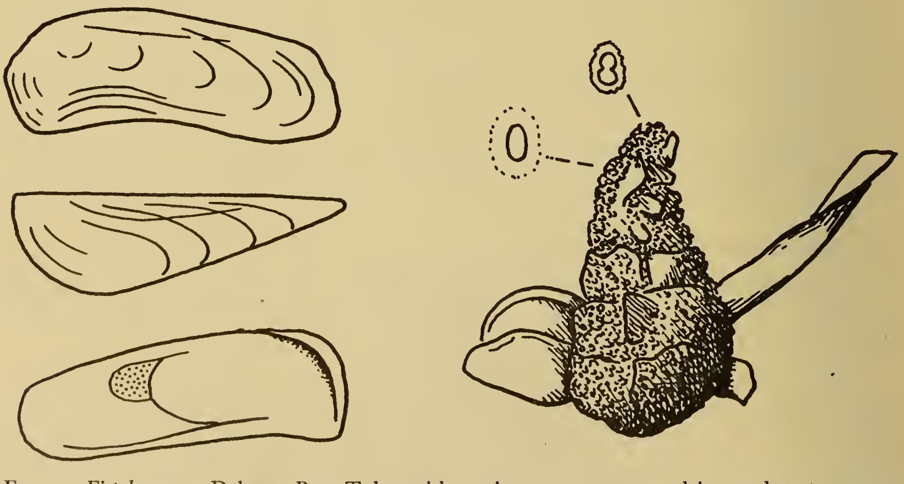

FIG. 34. *Fistulana* sp., Delagoa Bay. Tube, with sections at aperture and internal septum near aperture; lateral, dorsal, and internal views of left valve.

Fam. **Pholadidae**

Heppell, 1963, p. 33 (diagrams of shell and muscle-scars; key to British species).

Pholas dactylus Linn.

Pholas dactylus Linn. Sowerby, 1849, p. 485, pl. 102, figs. 10, 11, and pl. 105, fig. 45 (dwarf and distorted); 1892, p. 54; Turton, 1932, p. 258, pl. 70, no. 1830.
Pholas jordani van Hoepen, 1941, p. 171, pl. 9, figs. 3–7, pl. 10, figs. 1, 2.

Postero-dorsal and ventral margins gently converging posteriorly; hind end rounded. Prickles at intersections of the radial and concentric lirae squamose, diminishing slightly in size towards the anterior groove; dorsal half of groove with growth-lines only. Prickly concentric lirae farther apart in juveniles than in adults (cf. van Hoepen, pl. 9, fig. 7).

Up to length 117, alt. 40 mm. (van Hoepen, specimen from Port Alfred).

Fossil: Pleistocene, Port Elizabeth (van Hoepen).

Port Elizabeth (Sowerby); East London, Port Alfred, Algoa Bay, Jeffreys Bay, Great Brak River (Mossel Bay) (van Hoepen).

Strandfontein and Gordon's Bay (False Bay), Still Bay, Knysna (S. Afr. Mus.).

Distribution. Europe.

Remarks. The long description of *jordani* discloses no features separating it from *dactylus*. Van Hoepen made an *ex cathedra* statement that the South African shells were not the same as those figured by Sowerby (1872) and other authors; but comparison with a figure is not always very conclusive. No differences were specified, except such slight differences as are attributable to individual variation.

In support of his contention that the South African *Pholas* is distinct from *dactylus* van Hoepen quoted a statement by Tomlin. A large 117 mm. long valve from Port Alfred (figured nat. size by van Hoepen, pl. 10, fig. 1) was apparently seen by Tomlin (van Hoepen, p. 174). As quoted by van Hoepen (p. 174) Tomlin is alleged to have said: 'Not at all the same as our British *dactylus*. I have always expected that Bartsch's *alfredensis* would occur very much larger than he described it. *This is evidently the same species* [ital. mine]'. Tomlin would not have regarded a shell with umbonal partitions (*Pholas*) as the adult of a species without such partitions (*Barnea*); of course *alfredensis* is not the same as *dactylus*. But van Hoepen seems to have misconstrued Tomlin, and casuistically seized upon Tomlin's words 'not at all the same as . . . *dactylus*' as justification for his *jordani* n.sp.

I have compared South African shells in South African Museum with a series of British *dactylus*, and can find no specific differences.

The number and proximity of the radial and concentric lirae varies. In one valve (Gordon's Bay) the concentric lirae, including those on the younger part of the shell, are more numerous than usual; and the radial lirae in a space of 25–30 mm. below the umbo are very closely crowded together. The altitude of the shell is at least 33 mm., but the hinder part is broken away; on the remaining portion the growth-lines are more broadly rounded than in normal shells.

Barnea alfredensis Bartsch

Pholas fragilis (*non* Sow.), Smith, 1904a, p. 25.
Barnea alfredensis Bartsch, 1915, p. 210, pl. 44, figs. 1, 2; Turton, 1932, p. 258; van Hoepen, 1941, p. 168, pl. 8, figs. 1–4.
Pholas alfredensis Bartsch, Jaeckel, 1931, p. 243.

The postero-dorsal and ventral margins converge posteriorly to the narrowly rounded hind end. There is some variation in the amount of convergence, but the hind end can always be described as acuminate. The raised prickles at intersections of the radial and concentric lirae are more or less squamose, i.e. hollowed ventrally; they diminish in size towards the anterior groove; dorsal half of the groove with growth-lines only. Accessory plate (protoplax) linguiform, 12 × (posterior width) 6·5 mm. on a shell 35 mm. long.

Length 46, alt. 17 mm.; also 43 × 17, and 41 × 17 mm. Bartsch: 41 × 12 mm.; van Hoepen 29 × 13, 32 × 13, 34 × 13·5 mm.

Port Alfred and Kowie (Smith, Bartsch, Turton, van Hoepen).

St. Francis Bay and Algoa Bay (Jaeckel).

Table Bay, Gordon's Bay (False Bay), Still Bay (S. Afr. Mus.).

Off Cape Seal, 30 fathoms, 2 living (S. Afr. Mus. P.F. coll.).

Remarks. Dr. Muir obtained one beach-worn valve at Still Bay; one shell was extracted from rock at Gordon's Bay; the Table Bay specimens were extracted from a block of indurated limestone at Woodstock. In the latter block the depth of the burrows was 55–60 mm.

Barnea manilensis (Phil.)

Pholas manilensis Philippi, 1847, p. 72.
Pholas manillensis [*sic*] Smith, 1891, p. 395.
Barnia [*sic*] *erythraea* Gray, 1851, p. 382.
Pholas erythraea (Gray), Sowerby in Reeve, 1872, sp. 48; Cox, 1927, p. 61, pl. 9, figs. 4*a*, 4*b*.
Barnea durbanensis van Hoepen, 1941, p. 169, pl. 8, figs. 5–8, pl. 9, figs. 1, 2.

Postero-dorsal and ventral margins converging posteriorly, hind end narrowly rounded, acuminate. The raised prickles at intersections of radial and concentric lirae are solid, conical granules, except in the anterior groove where they increase in size and form flat imbricate points; dorsal half of groove with growth-lines only.

Length 78, alt. 24 mm. Van Hoepen: 78 × 26 and 89 × 25 mm.

Durban and St. Lucia Bay (van Hoepen). Also Algoa Bay (58 × 25 mm.) (van Hoepen).

St. Lucia Bay (S. Afr. Mus.; also U.C.T.); Chinde, mouth of the Zambezi River (S. Afr. Mus. coll. K.H.B.).

Distribution. Philippines; Red Sea. Zanzibar (fossil).

Remarks. Dr. Rehder *in litt.* to Prof. Day considered the St. Lucia Bay shells to be probably *erythraea.* Smith considered the latter a synonym of *manillensis* [*sic*].

Barnea truncata (Say)

Pholas truncata Say, 1822, p. 321; Sowerby, 1849, p. 488, pl. 104, figs. 29, 30.
Barnea truncata (Say), Nicklès, 1950, p. 232, fig. 454.

Postero-dorsal and ventral margins scarcely converging posteriorly, subparallel; hind end broadly rounded, subtruncate. Prickles on intersections of radial and concentric lirae squamose, diminishing in size towards anterior groove; dorsal half of groove with growth-lines only.

Length 62, alt. 27 mm.

Table Bay (S. Afr. Mus. coll. C. A. Fairbridge).

Distribution. West Africa from Senegal to Angola. East coast of North America.

Martesia striata (Linn.)

Martesia falcata (*non* Gray, *non* Wood), Sowerby, 1892, p. 54.
Martesia striata (Linn.), Lynge, 1909, p. 283 (references); Smith, 1910, p. 216; Turton, 1932, p. 258; van Hoepen, 1941, p. 175, pl. 8, figs. 9, 10, pl. 10, figs. 7–9; Nagabhushanam, 1958, p. 10, figs. 2*a*, *b*, and pl. 1, fig. 1.

Length 31, alt. (protoplax in situ) 15 mm. (U.C.T.: Durban). 42 × 16·4 mm. (Nagabhushanam).

Port Elizabeth (Sowerby); Tongaat (Natal), in seeds of *Barringtonia* (Smith); Durban and Port Alfred (van Hoepen); Durban Bay and Richards Bay (U.C.T.).

Delagoa Bay, in floating wood, living (S. Afr. Mus. coll. K.H.B.).

Bredasdorp coast, in lump of resin washed ashore (S. Afr. Mus.).

Distribution. Zanzibar, Dar-es-Salaam, Mozambique, Indo-Pacific. Also East coast of North and South America, West Indies, Europe, Mediterranean.

Fam. **Teredinidae**

The classic species *T. navalis* Linn. was recorded by Calman (1920) from Simonstown dockyard; but this material was later referred to another species (*robsoni*).

Hammersley-Heenan (1889, p. 313) gave an account of the ravages of 'Teredo navalis' in bridges over the Zwartkops River at Port Elizabeth.

For specific determination the pallets are essential, the shells of the different species being less well differentiated. Realization of the usefulness of the pallets in distinguishing species was a step forward in the taxonomy of the family, but there seems to be a danger of its leading modern investigators into excessive species-mongering.

Some species, e.g. *navalis*, are incubatory, retaining the larvae in the gill-pouches until the shelled stage; when liberated they swim actively around the wood in which the parent bores, and settle down almost immediately (Lebour, 1938).

Teredo robsoni Roch

Fig. 35 *a*, *b*

Teredo navalis (part, *non* Linn.), Calman, 1920, p. 292, fig. 1B.
Teredo robsoni Roch, 1931, p. 209, pl. 23; Moll & Roch, 1937, pp. 169, 178.

Stalk of the pallet passing gradually into blade, which is oblong, slightly constricted near the end, distally covered by brown cuticle enclosing a calcareous knob.

Simonstown (Calman; Moll & Roch).

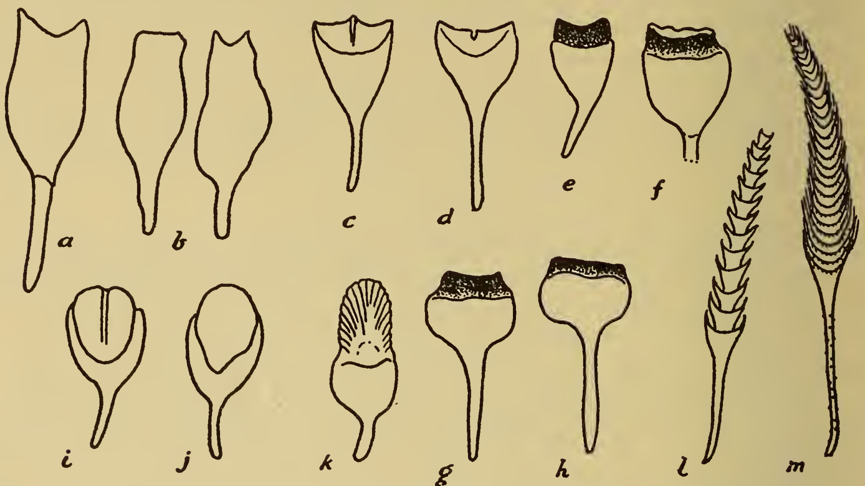

Fig. 35. Pallets of *Teredinidae*: *a*, *Teredo robsoni* Roch, after Calman. *b*, after Roch. *c*, *mannii* (Wright) after Wright, and Roch & Moll. *d*, after Calman.* *e*, *massa* (Jouss.) Lamy, after Roch & Moll. *f*, specimen from East London. *g*, *h*, specimens from Knysna. *i*, *petersi* Moll, after Moll. *j*, *alfredensis* v. Hoepen, after van Hoepen. *k*, *clava* Gmelin, after Roch & Moll. *l*. *Bankia stutchburyi* Leach, Sow. *m*, *capensis* (Calman).

* Does not apply to *mannii*; see text.

Remarks. Calman regarded *pedicellata* Quatrefages as possibly a synonym of *navalis*, and in the absence of a satisfactory definition of the former, recorded the South African examples as *navalis*.

Moll & Roch (1931) figured the pallets of *navalis*, *pedicellata*, and *robsoni*; *navalis* has the outer surface excavate distally, and no calcareous knob; the other two are not excavate but have a knob surrounded by cuticle. There seems no tangible difference between *pedicellata* and *robsoni*; and the former has been recorded from as far south as Lobito Bay, and St. Helena; in view of the northward-flowing Benguella current, might one perhaps say *robsoni* has been recorded as far north as Lobito Bay and St. Helena? (cf. Moll & Roch, 1937, p. 180). In other words, is *robsoni* only a synonym of *pedicellata*?

Nevertheless the occurrence of *navalis* in South Africa seems not unlikely. Some specimens from wharfpiles at Mossel Bay (U.C.T., 1957) have pallets shaped like those of *navalis*. The distal margin is exacavate between the two lateral horns (fig. 35*a*, after Calman, 1920, fig. 1 B), and there is no calcareous knob (cf. definition in Bartsch, 1922, p. 17, and pl. 32, fig. 2). Other specimens from Port Elizabeth and East London are similar as regards the valves, but the pallets are missing.

Teredo mannii (Wright)

Fig. 35 *c*

Kuphus mannii Wright, 1866, p. 565, pl. 65, figs. 1–8.
Teredo mannii (Wright), Roch & Moll, 1929, p. 15, fig. 14; Moll & Roch, 1931, p. 210, fig. 26; 1937, pp. 164, 176, 185, 187, chart 1.
Teredo (*Kuphus*) *manni* [*sic*] (Wright), Roch, 1955, p. 126, fig. 1.
[*Non*] *Teredo mannii* Calman, 1920, p. 395, figs. 2, 3; Nagabhushanam, 1958, fig. 1 *i* = *Dicyathifer caroli* Iredale, 1936.

Blade of the pallet triangular, distally excavate on outer side, divided by a median rib which projects more or less beyond the distal margin. Calman's (1920, fig. 2) and Nagabhushanam's (1955, fig. 1 *i*) specimens have been referred to a different species.

Mozambique, Beira, Tongaland (northern Zululand) (Moll & Roch, 1937).

Distribution. East Africa, Querimba Islands, Comoro Islands and Madagascar, Réunion, East Indies, Australia.

Teredo massa (Jouss.) Lamy

Fig. 35 *e–h*

Teredo massa Jousseaume, 1923, p. 176, figs.; Roch & Moll, 1929, p. 14, fig. 13; Moll & Roch, 1931, p. 210, fig. 23; 1937, pp. 165, 176, 183, 184, 185, 187, chart 1.

Pallet with a deep cup-shaped excavation, distally with projecting cuticle.

Durban (Moll & Roch, 1937).

Distribution. Aden, Erythraea; Madagascar.

Remarks. Some specimens in South African Museum from Knysna (coll. K.H.B. 1938) and East London (fig. 35 *f*) appear to be nearest to this species in the shape of the pallets. In the Knysna examples (fig. 35 *g*, *h*) the blade of the pallet is broader than long, and the stalk long and slender.

The Knysna specimens were incubatory.

Teredo petersi Moll

Fig. 35 *i*

Teredo petersi Moll, 1929, p. 6, pl. 1, fig. 3; Thiele, 1935, fig. 855; Moll & Roch, 1937, pp. 172, 176, 185, chart 1.
[?] *Teredo gregoryi* Dall, Bartsch, Rehder, 1938, p. 212, pl. 55, figs. 1–5.

Pallet 'finger-nail' shaped, the nail portion with a median groove on one side and a ridge on the reverse side.

Querimba Island, Portuguese East Africa (*petersi*). ? Hawaii (*gregoryi*).

Remarks. The description of the shell of *alfredensis* van Hoepen (1941, p. 176, pl. 10, figs. 3–6) discloses no specific characters strong enough to justify a n.sp.

The pallet (fig. 35*j*), however, belongs to the group of species with 'finger-nail' shaped pallets, viz. *malleolus*, *gazellae*, *diederichseni*, and *petersi* (figures in Roch & Moll, 1929), *thomsonii* Tryon (figure in Bartsch, 1922, pl. 34, fig. 4) and *gregoryi* (loc. cit., *supra*).

Another species with comparable pallets, without median groove on the nail-like portion, is *spärcki* Roch (1922, no. 13, p. 15, pl. 2, fig. 4) from the Philippines.

The Port Alfred pallet shows no median groove on the outside surface of the nail-like portion, thus differing from *petersi*. Nair, however, figured (1954, fig. 7*c*) a Madras example of the Hawaiian *gregoryi* without a median groove.

Teredo clava Gmelin

Fig. 35 *k*

Teredo (*Hyperotus*) *gregata* (*non* Lam.), Sowerby, 1892, p. 54.
Uperotis clava (Gmelin), Smith, 1910, p. 217.
Teredo clava Gmelin, Roch & Moll, 1929, p. 8, fig. 9; Moll & Roch, 1937, pp. 172, 176, 186, 187, charts 1 and 3; Nair, 1956, p. 407, figs. 8 *a–c*.

Shell short (antero-posteriorly), middle part elongate (dorso-ventrally), auricle narrow. Pallet thick, distal portion of blade with radiating riblets.

Port Elizabeth (Sowerby: 'S. Africa'); Port St. Johns, Port Grosvenor (Moll & Roch); Tongaat (Natal) (Smith); Tongaland (northern Zululand) (Moll & Roch).

Distribution. Mauritius, Ceylon, India, East Indies, Australia.

Remarks. Lives in floating seeds of the mangrove *Xylocarpus granatum* (= *Carapa moluccensis*). Smith recorded the Tongaat specimen from the seeds of *Barringtonia*. Moll & Roch's chart 3 shows the coinciding distribution of the *Teredo* and *Xylocarpus*, the South African records being due to drifting in the Mozambique current.

The seeds of *Xylocarpus* and *Barringtonia* have been found washed ashore as far west as Still Bay and the coast of the Riversdale Division (Muir, 1937, pp. 26, 27, 44, 75).

Teredo ancilla n.sp.

Fig. 36

Shell narrow (antero-posteriorly). Anterior part with *c.* 30 rasping ridges. Median part consisting of the anterior area only; ends of the ridges on the posterior margin forming an irregular series of small lobules, which become stronger ventrally. No middle area with groove. A smooth and very narrow flange seems to represent the posterior part, expanding dorsally into the auricle; no line of junction demarcating the auricle. Internally, the anterior edge of anterior part and median part thickened. Anterior and median parts dorsally inflexed to form a smooth ledge, from which the blade depends; in side view the ridged and smooth areas meet in a sharp keel. Dorso-ventrally 13 mm., antero-posteriorly (fig. 36 *b*) 8 mm.

Pallet club-shaped, total length 11 mm., stalk 7 mm.; club broader than long, 7 × 4 mm., externally slightly hollowed, internally slightly biconcave with feeble median rib; distal margin with slight median projection. Brownish.

Animal (as preserved slightly curved) *c.* 40 × (anteriorly) 12, (posteriorly) 10 mm. Dirty white. The mantle collar in front conceals the auricle and narrow flange-like posterior part of the shell. Ventrally an elongate oval grey area where the mantle is very thin, with the gonads and the black intestine showing through. Inhalent and exhalent siphons separate throughout their length, the former with a few inconspicuous, but probably extensible, papillae around its opening.

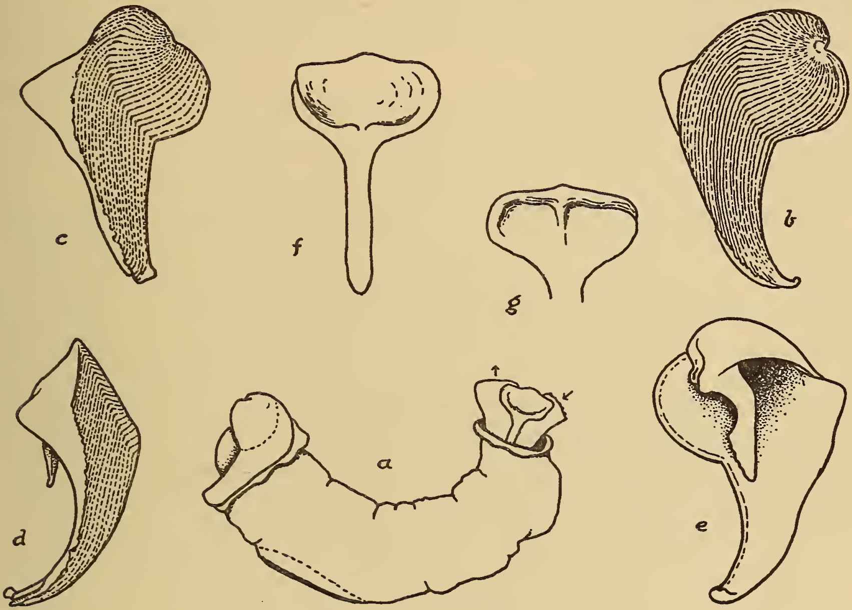

FIG. 36. *Teredo ancilla* n.sp.

FIG. 36. *Teredo ancilla* n.sp. *a*, animal (ridges on the valve not shown). *b*, *c*, *d*, three external views of valve. *e*, internal view. *f*, *g*, external and internal views of pallet.

Umlalazi estuary, Zululand, from a log in mangrove swamp, one specimen (U.C.T.).

Remarks. Compared with most species of Teredo this specimen has a short and stout body, at least as preserved. It is soft and pliable, but the gills in the hinder half of the body are crumpled. Thus there seems to have been a certain amount of contraction in preservation, and perhaps a quarter of its present length could be added to give its length when extended.

The pallets somewhat resemble those of *T. mannii* and *Bactronophorus thoracites*, but without the distal protuberance of the latter. The club, however, is broader relatively to its length.

The valves are remarkable for the reduction in width (i.e. in the axis of the animal) of the median part, involving the suppression of the middle area with its usual groove. In the literature available to me, two illustrations appear to represent an intermediate stage in reduction of the median part: Wright's (1866) pl. 64, figs. 11, 12, of 'Calobates' *thoracites*, and Nair's (1956) figs. 8 *a*, *b* of *T. clava*. Further, Moll & Roch (1931*b*, pl. 24, fig. 24 right) have given a figure (seemingly a retouched photograph) of the front end of the animal of *T. arenaria*, which shows the right valve and the mantle collar resembling very closely the present specimen.

T. (*Kuphus*) *arenaria* (Lam.) is a sand-dwelling species with a characteristic tube (Thiele, 1934, p. 935). Pallets attributable to this species are only known from a specimen consisting of the posterior (siphonal) end (50 cm. × 5 cm.) (Moll & Roch, 1931*a*, p. 15; and 1931*b*, p. 210, pl. 24, fig. 24 left).

As regards the *right*-hand figure in this last reference, Moll & Roch made no mention of a specimen of the anterior end with the valves, and gave no explanation of the inclusion of a photograph of such a specimen in figure 24. In 1931*c* (p. 17) they merely repeat that only the siphonal end is known. The latter is in the British Museum, and presumably the anterior end is also there. Thiele (1934, p. 935) said the valves of *arenaria* were not adequately known.

Sivickis (1928) described and figured the valves of *Teredo dubia*, a species related to *arenaria*, and like the latter a sand-dweller. When young the valves were described as broad like those of a 'normal' Teredo; but in the adult they become eroded and narrow, and have the same appearance as the right-hand figure in Moll & Roch (1931*a*). The pallets of *dubia* are similar to those of *arenaria*, and the former may prove to be a synonym of the latter.

Although the valves of the present specimen appear to resemble those of *dubia* and also those presumed to belong to *arenaria*, the pallets are different, and the animal is a wood-borer. The institution of a n.sp. seems advisable (from the resemblance of the pallet to a dust-pan: *ancilla*, a housemaid).

T. radicis Moll (in: Moll & Roch., 1937, p. 182), living in the roots of mangroves at East London and ? East Africa, was very briefly described. Pallets semicircular, distal margin straight or slightly concave, stalk awl-shaped; valves with anterior part large and rhomboidal, anterior middle area narrow, rasping-ridges numerous (*c.* 100). The description of the pallets might possibly apply to the present specimen, but not that of the valves.

Bankia stutchburyi Leach, Sow.

Fig. 35 *l*

Xylotrya stutchburyi (Leach, Sow.), Smith, 1910, p. 216, pl. 8, fig. 8–8*b*.
Bankia stutchburyi Leach, Sow., Roch & Moll, 1929, p. 19; Moll & Roch, 1931, p. 213, pl. 24 (useless photo).
[?] *Teredo stutchburyi* (Leach, Sow.), Turton, 1932, p. 259, pl. 70, no. 1833.

Pallet composed of 12–14 clearly separated triangular segments with cuticular spines at the distal corners. Length and alt. of shell 6 mm., pallet *c.* 10–12 mm.

Port Elizabeth and Durban (Smith).

Off Cape St. Blaize, 30 fathoms, in waterlogged timber (S. Afr. Mus. P.F. coll.).

In planks dredged off Still Bay (34° 40′ S., 21° 35′ E.), 70–77 metres (U.C.T.).

Distribution. East Indies, Christmas Island.

Remarks. Better South African material is required. *B. indica* Nair, 1954 (p. 393, fig. 3) seems closely allied and may possibly be a synonym.

Bankia capensis (Calman)

Fig. 35 *m*

Xylotrya capensis Calman, 1920, p. 402, figs. 9–11.
Bankia capensis (Calman), Roch & Moll, 1929, p. 21, fig. 20; Jaeckel, 1931, p. 243; Moll & Roch, 1931, p. 215, fig. 41; 1937, pp. 176, 180, chart 1.

Pallet feather-like, composed of a large number of short and broad crescentic segments, the lateral apices produced as fine filaments, stalk granulose. Length of valve 15, alt. 14 mm.; pallet 30 mm. (S. Afr. Mus.); Calman: 12·5 × 11·5, pallet 46 mm.

Simonstown (Calman). Lüderitzbucht and Swakopmund (Roch & Moll); Plettenberg Bay (Jaeckel). False Bay (S. Afr. Mus. coll. Mrs. Connolly).

St. Helena Bay, boring into Eucalyptus piles (S. Afr. Mus.).

Remarks. Compare the Pacific Ocean *B. setacea* Tryon (pallet figured in Bartsch, 1922, pls. 4, 5, and 30, fig. 3; and in Roch, 1931, fig. 11).

Fam. **Lyonsiidae**

Bartsch recorded the genus *Lyonsia* from South Africa in 1915, and Turton described the species *densecostata* (1932, p. 229, pl. 59, no. 1602) from Port Alfred.

Lyonsia formosa Jeffreys

Lyonsia formosa Jeffreys, 1881, p. 930, pl. 70, figs. 1, 1*a*.

The posterior half and the hinge of a very thin and delicate right valve appear to agree with the description and figure of this species.

Cape Point N. 86° E. 43 miles, 900–1000 fathoms, one valve (S. Afr. Mus. No. A3671. P.F. coll.).

Distribution. Atlantic, Canaries; Gulf of Mexico. 349–620 fathoms.

Fam. **Pandoridae**

Prashad (1932, p. 322) used *Calopodium* Bolten-Röding 1798 (Fam. *Calopodiidae*) because *Pandora* Hwass in Chemnitz 1798 was not used binominally, and is therefore inadmissible. Thiele (1934), however, retained the more familiar name *Pandora*.

Pandora dissimilis Sow.

Fig. 37 *a–d*

Pandora dissimilis Sowerby, 1894, p. 374; 1897, p. 21, pl. 6, fig. 33.

Nearly equivalve, but left valve slightly convex, right valve almost flat. Antero-dorsal margin may be slightly concave in young shell, but later becomes straight or slightly convex; postero-dorsal margin straight or very slightly convex (when not distorted), In young shells a very shallow groove from umbo to near postero-dorsal corner, less obvious in older shells. Left valve with an anterior and posterior lamellar lateral tooth; right valve with a very strong cardinal tooth, lamellate where attached to the shell, but expanding into a diamond-shaped apex which leaves a similar-shaped scar where it impinges against the left valve. Adductor muscle scars not sunken, though the antero-dorsal margin of the anterior adductor may be slightly impressed.

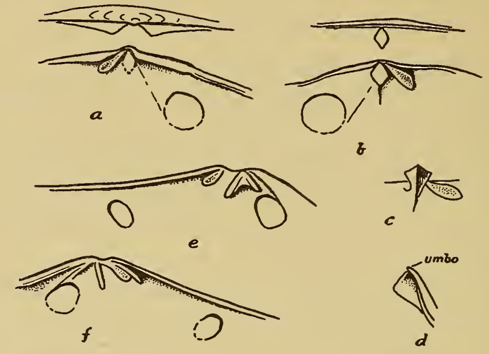

Fig. 37. *Pandora dissimilis* Sow. *a*, left valve hinge with dorsal view, diamond-shaped scar against which right cardinal tooth impinges. *b*, right valve hinge with dorsal view. *c*, *d*, ventral and posterior views of cardinal tooth in right valve. *e*, *f*, *P. similis* Sow. hinges of left and right valves.

Length 45, alt. 25 mm. (Sowerby); 40 × 24 mm. (S. Afr. Mus.); smallest seen: 15 × 8 (at vertical from umbo) or 9 mm. (greatest altitude).

Cape Town (Sowerby); Table Bay (S. Afr. Mus.).

False Bay, 23 fathoms, one living (S. Afr. Mus. P.F. coll.).

False Bay (34° 19′ S., 18° 30′ E.), 52 metres, living (U.C.T.).

Cotype in South African Museum. Reg. No. 5622.

Remarks. Varies somewhat in shape, e.g. 30 × 19 and 30 × 14 mm. (greatest alt.); and sometimes distorted, e.g. 35 × (vertical from umbo) 18, (greatest alt.) 23 mm., and 32 × 9 and 14 mm.

Pandora similis Sow.

Fig. 37 *e*, *f*

Pandora similis Sowerby, 1897, p. 29.

In shape resembling *inaequivalvis* (Linn.). Inequivalve, left valve convex, right smaller (dorso-ventrally), flat or sometimes slightly subconcave. Antero-dorsal margin sloping to rounded anterior end; postero-dorsal margin concave. Two low ridges from umbo to subrostrate hind end following the curve of the dorsal margin; covered distally with crinkly periostracum. Left valve with long ridge-like posterior lateral tooth, and a feeble anterior lateral, a Λ-shaped cardinal tooth; right valve with short posterior lateral ridge, a slender anterior ridge, and 2 diverging cardinals. Adductor muscle scars sunken, the anterior more so than the posterior.

Pinkish when alive. Length 23, alt. 13 mm.

Durban (Sowerby; also S. Afr. Mus.).

Off Morewood Cove (Natal), 27 fathoms, one living; off Umvoti River, 27 fathoms, 2 living; off Umhloti River, 25 fathoms, 15 living, numerous valves (S. Afr. Mus. P.F. coll.).

Cotypes from Bluff Channel, Durban (don. J. H. Ponsonby) in South African Museum (A29743).

Fam. **Thraciidae**

The British *Thracia villosiuscula*, as well as *capensis*, are recorded from Port Elizabeth. Turton thought he found the latter at Port Alfred, and also *distorta*, another British species. He added *kowiensis*, described from juvenile shells.

Thracia capensis Sow.

Fig. 38 *a*

Thracia capensis Sowerby, 1889b, p. 156, pl. 3, fig. 4; 1892, p. 55, pl. 2, fig. 60; ? Turton, 1932, p. 229.

Thin, equivalve, but right valve a little more convex than the left, inequilateral, oblong-oval, posteriorly truncate and slightly gaping, umbonal ridge very faint, growth-lines only. Outer ligament short, inner ligament pit small, obliquely triangular, at anterior end of the thickened dorsal margin. Pallial sinus as deep as broad, extending to vertical from umbo. White.

Length 41, alt. 25 mm. Sowerby's description gave 15 × 12 mm., his 1889 figure is 16 × 11, and his 1892 figure is 16 × 10 mm.

Port Elizabeth (Sowerby). ? Port Alfred (Turton).

Gordon's Bay (False Bay) living (Dr. H. Ackert, 1960, 1962); Smitswinkel Bay (False Bay) (Mrs. Connolly 1962).

Remarks. Corresponds with Sowerby's description, but is a trifle more inequilateral than his figures; cf. Turton's remark (1932, pp. 229, 230).

Thracia alfredensis (Bartsch)

Ungulina alfredensis Bartsch, 1915, p. 196, pl. 43, figs. 1, 2, pl. 54, figs. 1, 10; Turton, 1932, p. 236, pl. 62, no. 1651 (2 figs.); Barnard, 1962b, p. 193.

The shape varies, as might be expected in a species living in rock crevices: length 25, alt. 17, thickness 11 mm., also 21 × 19, 21 × 16 (Langebaan, U.C.T.); 18 × 12·5 (Bartsch); 14 × 14 (Turton); 12 × 9·5, 10 × 5 × 8, 11 × 9·5, and 9 × 9 mm. (S. Afr. Mus.). The earlier growth-lines on the last mentioned subcircular shell are oval. The cup containing the cartilaginous pad is conspicuously prominent.

The shagreened ('microphlyctous') surface is seen only in unworn examples.

Fossil: Pleistocene, Sedgefield near Knysna (A. R. H. Martin).

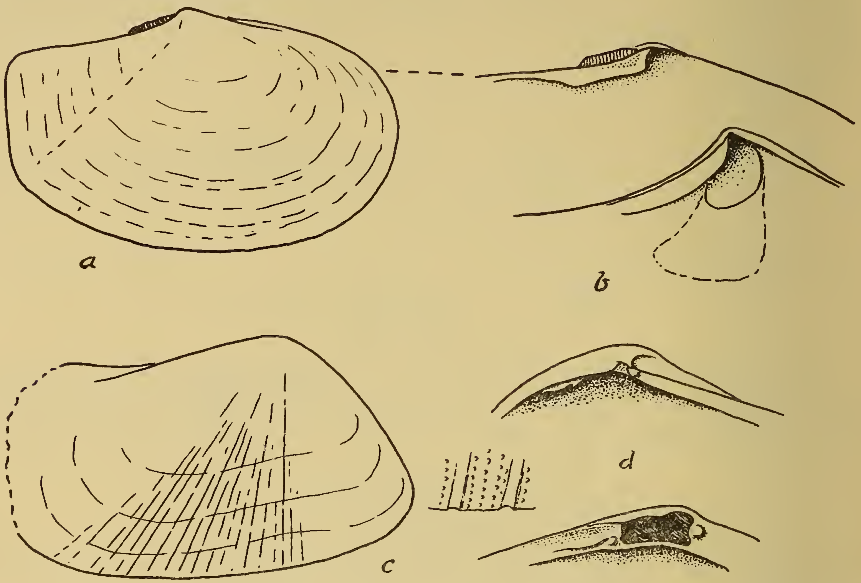

FIG. 38. *a*, *Thracia capensis* Sow., with hinge of left valve. *b*, *Thraciopsis agulhasensis* n.sp., hinge of left valve. *c*, *Lyonsiella agulhasensis* Jaeckel, right valve with sculpture further enlarged, the radial striae very faint. *d*, hinge, with ventral view to show ligament pit.

Port Alfred (Bartsch, Turton); Sea Point, Cape Town (S. Afr. Mus. coll. K.H.B.); Still Bay (S. Afr. Mus. coll. Mrs. Connolly).

False Bay, 11 fathoms (S. Afr. Mus. P.F. coll.).

Langebaan (Saldanha Bay); False Bay; 34° 51′ S., 19° 55′ E., 22 metres (U.C.T.).

Remarks. This species is transferred to the present genus because it does not agree, either in shell or animal characters, with *Ungulina*. Bartsch had only beach-worn material, but even so the hinge as figured (pl. 54, figs. 1, 10) is scarcely that of *Ungulina*. Presumably Bartsch's shells did not show the pallial sinus, although in the interior view (pl. 43, fig. 2) it can be traced—with a little imagination—as also in Turton's figure (pl. 62, no. 1651).

The animal definitely takes *alfredensis* out of *Ungulina*, and places it in *Thracia*. Ligament mainly internal, in a spoon-shaped process in each valve. Pallial sinus wide and shallow, more or less rectangular. Mantle with small anterior pedal opening, and a posterior opening. Siphons separate, apically fringed. A single gill on each side, thick, pleated, with an oblique furrow separating the dorsal and ventral portions.

Thraciopsis agulhasensis n. sp.

Fig. 38 *b*

Thin, equivalve, inequilateral (umbo 4 mm. fron hind margin), oblong-oval, posteriorly truncate, surface smooth, with growth-lines only. Hinge in left valve without teeth, posterior dorsal margin slightly thickened; ligament internal, in an oval shallow pit, adnate to the shell but anterior edge just free, with ossicle forming a subtriangular scar. Pallial sinus as deep as broad, extending forwards to vertical from umbo. White, interior feebly nacreous, the ossicle scar distinctly nacreous.

Length 10·5, alt. 6 mm.

Mantle edges fused, with branchial and pedal openings. Foot (as preserved) large, triangular. Siphons separate, apically fringed, no eyes.

34° 59′ S., 22° 18′ E., 58 fathoms, one living (U.C.T.).

Remarks. The hinge excludes this species from *Thracia*. It is included, with some hesitation, in the Australian genus *Thraciopsis* Tate & May 1900 (*Alicia* Angas 1867, nom. preocc.). Angas (1867, p. 908, pl. 44, fig. 1) characterized the genus by having a more or less prominent posterior callus on the right valve fitting into a cavity on the left valve; ligament internal, perpendicularly below umbo, covered by a large triangular ossicle. He gave only a small figure of the hinge. Unfortunately the umbonal area of the present right valve is broken.

Fam. **Laternulidae** (**Anatinidae**)

Clistoconcha insignis Smith

Clistoconcha insignis Smith, 1910, p. 218, pl. 8, figs. 9–9*c*; Bartsch, 1915, p. 191; Turton, 1932, p. 230; Kühnelt, 1956, p. 31, fig. 8 (redrawn after Smith).
Clistoconcha costata Turton, 1932, p. 230, pl. 59, no. 1607.

Recorded from Tongaat (Natal) and Port Alfred. U.C.T. has taken it (6 mm. long) in False Bay, and also at 31° 41′ S., 29° 33′ E., 90 metres.

Turton's *costata* is doubtless a synonym, the ribs being due to its being wedged up against a ribbed shell, not to any inherent specific peculiarity.

Fam. **Verticordiidae**

Halicardia flexuosa (Verrill & Smith)

Halicordia [*sic*] *flexuosa* (Verrill & Smith), Tomlin, 1937, p. 23, fig. 1 (references); Barnard, 1963b, p. 450.

Tomlin recorded two specimens (one of them now deposited in British Museum) taken by the *Pieter Faure*. A third specimen, length and altitude 26 mm., has been obtained a little farther to the north-west of the P.F. locality, viz.: 33° 50′ S., 17° 21′ E., 600 fathoms (S. Afr. Mus. A9707 coll. F. H. Talbot, Aug. 1959).

Verticordia lamothei D. & F.

Fig. 39 *a*

Verticordia lamothei Dautzenberg & Fischer, 1897, p. 227, pl. 7, figs. 13–16; Dautzenberg, 1927, p. 347, pl. 9, figs. 15–18; Jaeckel, 1931, p. 245.

Subquadrangular, inflated, anterior margin concave. Radial ribs 21–23, whole surface (except lunule) minutely granulate, growth-lines traceable. Margin not (or not strongly) scalloped.

Length, alt., and thickness 10 mm.

35° 19′ S., 20° 12′ E., 126 metres; 35° 9′ S., 18° 33′ E., 564 metres (Jaeckel).

Off Cape St. Blaize, 125 fathoms, one living (S. Afr. Mus. A9562. P.F. coll.).

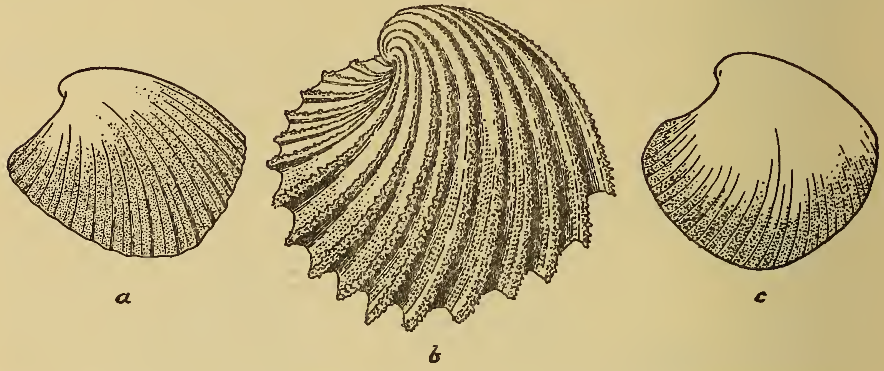

Fig. 39. Left valves of: *a*, *Verticordia lamothei* D. & F. *b*, *ericia* Hedley. *c*, *inornata* Jaeckel.

Distribution. Azores (Dautzenberg & Fischer). East coast of Africa (Jaeckel).

Remarks. Jaeckel seems to have been correct in identifying specimens from the southwest slope of the Agulhas Bank with the Atlantic *lamothei.* The present 5 mm. long specimen came from slightly farther east on the southern slope. Whether the East African specimens are identical is a matter for review.

Verticordia inornata Jaeckel

Fig. 39 *c*

Verticordia inornata Jaeckel, 1931, p. 245, pl. 10(5), figs. 124, 124*a*.

Subcircular ('schief herzförmig'), anterior margin concave. Very feeble radial riblets, *c.* 20 at 3 mm. alt., increasing to at least 30 in larger shells. Whole surface with extremely numerous and minute granules, sometimes somewhat pointed, arranged in radial lines. Margin entire.

Length 6·5, alt. 6 mm. (Jaeckel); 6 × 5·5 mm. (S. Afr. Mus.).

35° 26′ S., 20° 56′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres (Jaeckel).

Off Illovo (Natal), 27–30 fathoms, 2 valves; off Cape Morgan, 52 fathoms, one living, 6 valves; off Hood Point (East London), 49 fathoms, one valve;

Algoa Bay, 52 fathoms, one valve; off Cape St. Blaize, 125 fathoms, 2 valves (S. Afr. Mus. P.F. coll.).

Remarks. Although Jaeckel said that radial riblets were absent, the present specimens are undoubtedly identical with his species.

Verticordia ericia Hedley

Fig. 39 *b*

Verticordia ericia, Hedley, 1911, p. 96, pl. 17, figs. 1–3; Barnard, 1962a, p. 254; 1963c, p. 16.

Subcircular, inflated, umbones strongly curved forwards and downwards, lunule deeply impressed; anterior margin convex, whole margin (except hinge-line) deeply scalloped. Radial ribs 18–19, their crests covered with sharp prickly granules, no intermediary ribs; intervening grooves closely granulate, the granules more or less in radial lines, growth-lines not visible. Right valve with a strong knob-like cardinal tooth below the umbo (partly behind the lunule); left valve with the margin bordering the lunule slightly incrassate. Interior nacreous.

Length 8·5, alt. 8, thickness (one valve) 4 mm.

Off Cape Vidal (Zululand), 80–100 fathoms, 3 valves (one of them juv.) (S. Afr. Mus. No. 9564. P.F. coll.).

30° 40′ S., 50° 15′ E., 400 metres, one juv. valve and one broken (Fisheries Survey. *Africana II.* Station A1248.

Distribution. South Australia, 100 fathoms; New South Wales, 80 fathoms.

Remarks. There appears to be no character in these valves which is not in full agreement with Hedley's description and figures of the Australian species.

If Jaeckel (1931) was correct in identifying examples from off the East African coast as *lamothei*, the present valves cannot be conspecific, as one might perhaps have expected them to be. They differ from *lamothei* in having slightly fewer ribs, a more circular outline (anterior margin convex instead of concave), with conspicuously scalloped margin.

In the same characters *ericia* differs from the East Indies *crebrilirata* Prashad (1932, p. 324, pl. 7, figs. 19, 20), though there are several points of resemblance. Prashad's description of the hinge-teeth applies here also. *V. crebrilirata* has 25–26 ribs; the description does not mention any sculpture in the grooves.

Lyonsiella agulhasensis J. & T.

Fig. 38 *c*

Lyonsiella agulhasensis Jaeckel & Thiele, 1931, p. 250, pl. 10(5), fig. 133.

Shell thin, oblong-ovate, anterior margin declivous, antero-ventral corner somewhat angular; posteriorly somewhat enlarged, postero-dorsal margin straight, horizontal, posterior margin rounded. Concentric growth-lines not prominent, some of them more distinct anteriorly. Radiating lines or riblets scarcely raised above the surface, appearing chalky-white. Whole surface with minute prickles arranged in radial rows, 3 or 4 between each pair of riblets. No teeth, an internal ligament pit, defined anteriorly by a tiny tubercle continued as a lamella, and posteriorly by another tiny tubercle on the hinge margin. Muscle scars and pallial line indistinct. Interior slightly nacreous.

Length 13, alt. 8·5 mm. Up to 14 × 10·5 mm. (Jaeckel).

34° 51′ S., 19° 37′ E., 80 metres; 35° 16′ S., 22° 26′ E., 155 metres (Jaeckel & Thiele).

Lion's Head (Table Mountain) N. 67° E. 25 miles, 131–136 fathoms, one right valve; off Cape Morgan, 77 fathoms, 3 valves; off Illovo River (Natal), 27–30 fathoms, one valve (S. Afr. Mus. Nos. A9559, A9560, A9561. P.F. coll.).

Remarks. The shape is somewhat variable and irregular. E.g. the three valves from Cape Morgan: rounded oval, 7 × 6 mm.; oblong (somewhat distorted) 8 × 4·5 mm.; oblong-oval, deeper posteriorly. 6·5 × 4·75 mm.

Fam. **Poromyidae**

No further examples of *P. curta* Sow. 1904 have been found in the *Pieter Faure* collection.

Poromya gilchristi Sow.

Poromya gilchristi Sowerby, 1904, p. 15, pl. 7, fig. 10.

Surface minutely 'punctured' (? abraded granules). 'Very slight radiating ridges towards the posterior side.'

Length 25·5, alt. 18·5, thickness (valves together) 13 mm.

Off Umtwalumi River (Natal), 50 fathoms, one (Sowerby, P.F. material).

Off Cape Natal (Durban), 54 fathoms, one broken valve; off Tugela River, 47 fathoms, 2 broken valves (S. Afr. Mus. P.F. coll.).

Type ? in British Museum.

Remarks. The Cape Natal valve (left) has slight traces of radial ribs over the whole shell, but more noticeable posteriorly. The periostracum has been almost completely worn off the larger Tugela valve (left), and radial ribs are not traceable. More material is desirable.

Poromya striata Sow.

Poromya striata Sowerby, 1904, p. 16, pl. 7, fig. 11.

Surface minutely granulate. Periostracum thin, brown, forming raised radial thread-like ribs.

Length 22, alt. 16·5, thickness (valves together) 11·5 mm.

Vasco da Gama (Cape Point) S. 75° E. 13 miles, 166 fathoms (Sowerby, P.F. material).

Cape Point E. 26 miles, 210 fathoms, one valve; Vasco da Gama (Cape Point) N. 10° E. 13 miles, 85 fathoms, one living, one valve; Cape Point N. 50° E. 18 miles, 180 fathoms, one living; Cape Hangklip N.N.E. 31 miles, 95 fathoms, one living; Cape Hangklip N.E. ¾ N. 28 miles, 100 fathoms, 3 living; Browne's Bank (approx. 36½° S., 21¼° E.), 80–100 fathoms, one valve; off

Nieca River (East London), 53 fathoms, one living; one valve (S. Afr. Mus. P.F. coll.).

Type ? in British Museum.

Remarks. The locality given in the original description is impossible. The bearing is correct, and places the locality off the *west coast of the Cape Peninsula.* The words 'False Bay' were inadvertently inserted (? by whom). Moreover there is no such depth as 166 fathoms in False Bay.

I feel certain that *striata* was founded on better specimens than *gilchristi*, and will eventually become a synonym of the latter. The radiating ribs being superficial periostracal ridges are liable to abrasion, as is seen in the broken Cape Natal and Tugela valves mentioned above.

Poromya granosissima Sow.

Poromya granosissima Sowerby, 1904, p. 16, pl. 7, fig. 12.

A slight but distinct umbonal ridge ('angle'). Surface minutely and closely granulate, the granules arranged in radial alternating series (more or less quincuncial), flat-topped and often slightly tabulate, circular on anterior and median parts but becoming transversely oval or oblong on posterior part. No raised periostracal ridges.

Length 9, alt. 8, thickness (valves together) 5·25 mm. (Sowerby); 11 × 10 × 7·5 mm. (S. Afr. Mus.).

Off Cape Natal (Durban), 54 fathoms (Sowerby, P.F. material).

Same locality, 2 living, several valves (topotypes); off Tongaat, 36 fathoms, 4 valves; off Umhloti River, 27 fathoms, 2 living, several valves; off Umkomaas, 40 fathoms, 14 valves; off Tugela River, 37 fathoms, 3 valves; off O'Neil Peak (Zululand), 90 fathoms, 3 valves (S. Afr. Mus. P.F. coll.).

29° 46′ S., 31° 17′ E., 60–70 fathoms, one living (U.C.T.).

Type ? in British Museum. Topotypes in South African Museum.

Remarks. Sowerby stated that this species was more closely and conspicuously granulated than the European *granulata* Nyst; he did not, however, compare it with the North Australian *australis* Smith 1885, which according to Smith is also more coarsely granulated than *granulata.*

The East Indies *pergranosa* Prashad 1932 is also very similar, and has an umbonal ridge which apparently is absent in *australis.*

From the east coast of Africa Jaeckel (1931) has described *sansibarica* and *orientalis*; these, however, do not seem to be so closely allied to the above-mentioned species.

Fam. **Cuspidariidae**

Cuspidaria gigantea Prashad 1932 appears to be *nom. preocc.* by Verrill 1884.

Cuspidaria capensis (Smith)

Neaera capensis Smith, 1885, p. 45, pl. 9, figs. 5, 5*a*, *b*.
Cuspidaria nasuta (*non* Adams), Sowerby, 1904, p. 18, pl. 7, fig. 4; Jaeckel, p. 254.

Pyriform, a concave depression defining the rostrum, which is not as long as the rest of the shell, surface smooth, growth-lines somewhat irregular in strength but not forming concentric lirae. A moderately elongate, thin lamellate posterior lateral tooth in right valve; ligament pit sloping posteriorly.

Length 15, alt. 8, thickness 5 mm. (Smith); 21 × 10 × 7·5 mm. (Sowerby); 27 × 13 × 9 mm. (Cotype, S. Afr. Mus.); 32 × 15 × 12 mm. (Cape St. Blaize, S. Afr. Mus.). The valve from Browne's Bank lacks the rostrum but has alt. 17 mm. Smallest example seen: 12·5 × 6 mm.

34° 4′ S., 18° 37′ E., 150 fathoms (Smith). Cape Point Lighthouse N. 2° E., 14 miles, 85 fathoms, 2 living (Type and cotype of *nasuta*) (Sowerby). P.F. material.

33° 41′ S., 18° 03′ E., 178 metres; 35° 9′ S., 18° 32′ E., 564 metres (Jaeckel).

Lion's Head S.E. ¼ E. 11 miles (outside Table Bay), 69 fathoms, 2 living; 34° 34′ S., 18° 22′ E., 100 fathoms, one valve; Cape Point N.W. ½ W. 4 miles, 50 fathoms, one valve; Vasco da Gama (Cape Point) N. 40° E. 13 miles, 120 fathoms, one valve; Cape Point N.E. × N. 8 miles, 85 fathoms, one living; Cape Point N.E. × E. ¾ E. 8 miles, 91 fathoms, 2 living; off Cape St. Blaize, 105 fathoms, one valve; Browne's Bank (approx. 36½° S., 21¼° E.), 200 fathoms, one valve (S. Afr. Mus. P.F. coll.).

31° 14′ S., 16° 36′ E., 272 metres (s.s. *Africana*, per U.C.T.).

Type and cotype of *nasuta* in South African Museum, Nos. 14819 and A4432.

Remarks. As the name *nasuta* had been used by A. Adams (1864) I had thought of renaming Sowerby's species 'pharos', it having been taken within sight of the Cape Point Lighthouse. On further consideration, however, the characters of the *Challenger* and *Pieter Faure* shells, as well as the localities, clearly indicated that they were conspecific.

A broken right valve was taken by P.F. in Buffels Bay (False Bay) in 35 fathoms, its occurrence there might possibly be due to insetting currents from off Cape Point.

Jaeckel recorded *nasuta* Sow. from outside Table Bay and on the south-western slope of the Agulhas Bank; he identified a specimen from New Amsterdam, 496 metres, with *capensis*, but noted minor differences between his damaged shell and Smith's description.

Cuspidaria optima Sow.

Cuspidaria optima Sowerby, 1904, p. 17, pl. 7, fig. 16.
Cuspidaria rara Jaeckel, 1931, p. 253, pl. 10(5), fig. 139 (= juv.).
Cuspidaria agulhasensis Jaeckel, 1931, p. 253, pl. 10(5), fig. 140 (= juv.).

Pyriform, a concave depression defining the rostrum, which is about ⅓–½ of the rest of the shell, concentrically lirate, the lirae slightly oblique to the growth-lines, but near the margin (in adult) they become feebler and more or less concurrent with the growth-lines. A moderately elongate thin lamellate posterior lateral tooth in right valve; ligament pit sloping slightly posteriorly.

32·25, length alt. 20·5, thickness (valves together) 14 mm. (Sowerby); 30 × 18 × 12 mm. (cotype, S. Afr. Mus.); 30 × 17, 35 × 17·5, and 36 × 18 mm. (S. Afr. Mus.).

Off Umtwalumi River (Natal), 50 fathoms (Sowerby, P.F. material).

Same locality, one living (cotype); off Tongaat, 36 fathoms, one living; off Umvoti River, 27 fathoms, one living, one valve; off Umhloti River, 25–40 fathoms, one living, 3 valves; off Cape Natal (Durban), 47–54 fathoms, 3 living, 8 valves; off Cape Morgan, 77 fathoms, one valve juv.; off Hood Point (East London), 49 fathoms, one valve juv.; off Kei River, 51 fathoms, one valve juv.; 34° 27′ S., 25° 42′ E., 256 fathoms, one valve juv.; St. Francis Bay, 24–34 fathoms, one valve; off Cape St. Blaize 51 fathoms, one living, 2 broken valves (S. Afr. Mus. P.F. coll.).

34° 51′ S., 23° 41′ E., 100 fathoms, one juv. (U.C.T.).

35° 9′ S., 18° 32′ E., 564 metres (*rara*); 35° 19′ S., 20° 12′ E., 126 metres (*agulhasensis*) (Jaeckel).

Type ? in British Museum; cotype in South African Museum, No. 14764.

Remarks. The specimen figured by Sowerby and the cotype both have a relatively short rostrum; that of the cotype appears to be undamaged. Other specimens, including some seen and named by Sowerby, have a relatively longer rostrum. The proportions therefore are variable.

C. rara (7·75 × 4·5 mm.) and *agulhasensis* (3·5 × 2·2 mm.) are clearly juveniles; similar examples, 3·5–5 mm. long, were found in the P.F. bottom-samples.

A fragment from off Cape Vidal (Zululand) 80–100 fathoms appears to be conspecific.

Cuspidaria macrorhynchus Smith

Cuspidaria macrorhynchus Smith, 1895, p. 12, pl. 2, figs. 5, 5*a*; 1897, Moll, pl. 3, figs. 5, 5*a*; Jaeckel, 1931, p. 255; Prashad, 1932, p. 328, pl. 9, fig. 17.

Rostrum approximately as long as rest of shell, surface smooth, with growth-lines only. A moderately long thin lamellate posterior lateral tooth in right valve; ligament pit inclined posteriorly.

Single valve, length 27, alt. 12·5 mm.; bivalve shell, 20 × 9 × 6 mm.

Off Cape Natal (Durban), 440 fathoms, one living, one valve (S. Afr. Mus. A9565. P.F. coll.).

Distribution. Arabian Sea (Smith); East Indies, 535 and 918 metres (Prashad); Zanzibar Channel and Dar-es-Salaam, from 1° 49′ N. to 6° 39′ S., 400–1134 metres (Jaeckel).

Remarks. The specimens correspond with Smith's figures; the shell figured by Prashad appears to have had the rostrum broken.

Cuspidaria approximata Smith

Cuspidaria approximata Smith, 1896, p. 373; 1898, Moll, pl. 8, figs. 2, 2*a*.

Broadly pyriform, rostrum about ½ length of rest of shell, umbones strongly inflated, surface smooth, with growth-lines only, regular but at intervals (approximately 0·75–1 mm. apart) one slightly more prominent than the others, thread-like, not lirate or lamellate. A rather long lamellate posterior lateral tooth in right valve; ligament pit inclined posteriorly.

Length 17, alt. 12, thickness (valves together) 8·5 mm.

Off Umhloti River (Natal), 25 fathoms, one living, one valve (S. Afr. Mus. No. 14767. P.F. coll.).

Distribution. Andaman Islands, 450 fathoms.

Remarks. Has some resemblance to *salamensis* Jaeckel 1931 from Dar-es-Salaam, but has no lamella in either valve for the support of the posterior adductor muscle. It is more like the East Indies *convexa* Prashad 1932, the hinge of which was not described.

The difference in depth raises a doubt as to the identity of the Natal specimens with Smith's species.

Cuspidaria (Cardiomya) forticostata Sow.

Cuspidaria (Cardiomya) forticostata Sowerby, 1904, p. 18, pl. 7, fig. 15.

Anterior half (Sowerby said one-third, but see his figure) with *c.* 30 weak radial ribs, followed by 3 strong widely spaced ribs, with 1 or 2 fine intermediaries between each pair, posterior part with 7–8 fine ribs. A single linguiform posterior lateral tooth, projecting horizontally inwards, in right valve; ligament pit pointing ventrally or slightly anteriorly.

Topotype pinkish-fawn.

Length 13, alt. 8, thickness 6·25 mm. (Sowerby); 16 × 10·5 × 7·5 mm. (S. Afr. Mus.).

Off Cape Natal (Durban), 440 fathoms (Sowerby, P.F. material).

Same locality, one living (topotype) (S. Afr. Mus. A9566. P.F. coll.).

Type ? in British Museum; topotype in South African Museum.

Remarks. The topotype was found in the bottom-sample from the above locality. It is in perfect condition, and is larger than the one (presumably only one) sent to Sowerby.

Closely similar to *alcocki* Smith 1894 (figured: 1897, pl. 3, fig. 6) which has 4 strong ribs.

Cuspidaria (Cardiomya) gilchristi Sow.

Cuspidaria (Cardiomya) gilchristi Sowerby, 1904, p. 18, pl. 7, fig. 17.

Closely radiately ribbed except on the rostrum and on the antero-dorsal area. A single linguiform posterior lateral tooth projecting inwards, in right valve; ligament pit pointing ventrally or slightly anteriorly.

Length 14, alt. 9, thickness 7 mm.

Off Cape Natal (Durban), 85 fathoms (Sowerby P.F. material).

Same locality, 8 valves (topotypes, A9570); off Umhloti River, 40 fathoms, one valve; off Cape Morgan, 77 fathoms, 2 valves; off Cape St. Blaize, 125 fathoms, one valve (S. Afr. Mus. P.F. coll.).

Type ? in British Museum; topotypes in South African Museum.

Cuspidaria spp.

Until further material is obtained, no names are attached to the following specimens.

South African Museum A7458. 13 living, 3·5–8 mm. long. Shape of *lamellosa* Sars. With concentric thread-like lirae. Right valve with a lamellate triangular tooth anteriorly and posteriorly, the latter larger than the former.

Cape Point N. 89° E. 36 miles, 700 fathoms (P.F. coll.).

South African Museum A7793. 3 living. 11 × 6 mm. Shape of *platensis* Smith. Surface smooth, fine growth-lines only. A lamellate posterior lateral tooth in right valve; ligament pit small.

Cape Point N. 89° E. 36 miles, 700 fathoms (P.F. coll.).

See also Barnard, 1963b, p. 450.

REFERENCES

† indicates palaeontological papers

ADAM, W. & LELOUP, E. 1939. Résultats scientifiques du voyage aux Indes Orientales néerlandaises de LL.AA.RR. le Prince et la Princesse Léopold de Belgique. Gastropoda-Pulmonata, Scaphopoda et Bivalvia. *Mém. Mus. Hist. nat. Belg.* (Hors sér.) **2,** 20: 1–126.

ADAMS, A. 1851. Monograph of *Sphaenia*, a genus of lamellibranchiate Mollusca. *Proc. zool. Soc. Lond.* **1850**: 86–89.

ADAMS, A. 1856. Descriptions of thirty-four new species of bivalve Mollusca (*Leda*, *Nucula* and *Pythina*) from the Cumingian collection. *Proc. zool. Soc. Lond.* **1856**: 47–53.

ADAMS, A. 1862. Descriptions of some new species of *Limopsis* from the Cumingian collection. *Proc. zool. Soc. Lond.* **1862**: 229–231.

ADAMS, A. & REEVE, L. 1848–50. *The Zoology of the Voyage of H.M.S.* Samarang, *under the command of Captain Sir E. Belcher . . . during the years* 1843–46. Mollusca. London: Reeve, Benham & Reeve. [Part 1: 1–24, pls. 1–9, 1848 (Nov.). Part 2: 25–44, pls. 10–17, 1850 (May). Part 3: 45–87, pls. 18–24, 1850 (Sept.).]

ADAMS, H. & ADAMS, A. 1853–58. *The genera of recent Mollusca.* 3 vols. London: Van Voorst.

ADAMS, H. & ADAMS, A. 1854. Description of a new genus of bivalve Mollusca. *Ann. Mag. nat. Hist.* (2) **14:** 418. [The only applicable paper listed in the Royal Society's *Catalogue of scientific papers,* but p. 418 is quoted on both pp. 15 and 16, whereas Lamy (1937, pp. 186, 191) and Neave (*Nomenclator,* 1940, Gen. *Myrina*) quoted p. 76].

ANGAS, G. F. 1867. A list of species of marine Mollusca found in Port Jackson harbour, New South Wales, and on the adjacent coasts, with notes on their habits, etc. Part 2. *Proc. zool. Soc. Lond.* **1867:** 912–935.

ANGAS, G. F. 1878. Descriptions of six species of bivalve shells in the collection of Mr. Sylvanus Hanley, F.L.S. *Proc. zool. Soc. Lond.* **1878:** 859–861.

ANSELL, A. D. 1961. The functional morphology of the British species of Veneracea (Eulamellibranchia) *J. mar. biol. Ass. U.K.* **41:** 489–517.

ANTON, H. E. 1838(39). *Verzeichniss der Conchylien welche sich in der Sammlung von H. E. Anton befinden.* Halle.

BARNARD, K. H. 1959. Contributions to the knowledge of South African marine Mollusca. Part 2. Gastropoda: Prosobranchiata: Rhachiglossa. *Ann. S. Afr. Mus.* **45:** 1–237.

BARNARD, K. H. 1962a. New species and records of South African marine Mollusca from Natal, Zululand and Mocambique. *Ann. Natal Mus.* **15:** 247–254.

BARNARD, K. H. 1962b. Revised list of South African late Tertiary and Pleistocene marine Mollusca. *Trans. roy. Soc. S. Afr.* **36:** 179–196.

BARNARD, K. H. 1963a. Contributions to the knowledge of South African marine Mollusca. Part 3. Gastropoda: Prosobranchiata: Taenioglossa. *Ann. S. Afr. Mus.* **47:** 1–199.

BARNARD, K. H. 1963b. Deep sea Mollusca from west of Cape Point, South Africa. *Ann. S. Afr. Mus.* **46:** 407–452.

Barnard, K. H. 1963c. Deep-sea Mollusca from the region south of Madagascar. *Invest. Rep. Div. Fish. S. Afr.* **44:** 3–19.

Bartsch, P. 1915. Report on the Turton collection of South African marine mollusks, with additional notes on other South African shells contained in the United States National Museum. *Bull. U.S. nat. Mus.* **91:** i–xii, 1–305.

Bartsch, P. 1922. A monograph of the American shipworms. *Bull. U.S. nat. Mus.* **122:** 1–48.

Bisacchi, J. 1930. Le Nassariidae del Mar Rosso e del Golfo di Aden. *Ann. Mus. Stor. nat. Genova.* **55:** 43–70.

Bolten, J. F. *see* Röding, P. F.

Born, I. von. 1778. *Index rerum naturalium Musei Caesarei Vindobonensis.* Vindobonae.

Born, I. von. 1780. *Testacea Musei Caesarei Vindobonenis.* Vindobonae.

Bory de Saint-Vincent, J. B. G. M. 1824. *Histoire naturelle des zoophytes. In Encyclopédie méthodique.* Paris.

Braga, J. M. 1952. Materias para o estudio da fauna malacologica de Mocambique. *An. Jta Invest. Ultramar* **7,** 3: 65–127.

Broderip, W. J. & Sowerby G. B. 1829. Observations on new or interesting Mollusca contained in the Museum of the Zoological Society. *Zool. J.* **4:** 359–379.

Broekhuysen, G. J. & Taylor, H. 1959. The ecology of South African estuaries. 8. Kosi Bay estuary system. *Ann. S. Afr. Mus.* **44:** 279–296.

Bruguière, J. G. 1797. *Tableau encyclopédique et méthodique des trois règnes de la nature.* Part 19. Coquilles bivalves. Paris.

Bush, K. J. 1885. Additions to the shallow-water Mollusca of Cape Hatteras, N.C., dredged by the U.S. Fish Commission steamer *Albatross,* in 1883 and 1884. *Trans. Conn. Acad. Arts Sci.* **6:** 453–480.

Calman, W. T. 1920. Notes on marine wood-boring animals. 1. The shipworms (Teredinidae). *Proc. zool. Soc. Lond.* **1920:** 391–403.

Chemnitz, J. H. 1784–95. *Neues systematisches Conchyliencabinet.* **7–10.** Nürnberg.

Chenu, J. C. 1843–53. *Illustrations conchyliologiques.* Paris.

Chenu, J. C. 1862. *Manuel de conchyliologie et de paléontologie conchyliologique.* **2.** Paris.

Clarke, A. H., *Jr.* 1961. Abyssal mollusks from the South Atlantic Ocean. *Bull. Mus. comp. Zool. Harv.* **125:** 345–387.

Clessin, S. 1889. Mytilidae. *In* Martini-Chemnitz. *Neues systematisches Conchyliencabinet.* 2nd ed. Nürnberg.

Connolly, M. 1939. A monographic survey of South African non-marine Mollusca. *Ann. S. Afr. Mus.* **33:** 1–660.

Conrad, T. A. 1834–37. Descriptions of new marine shells from Upper California. *J. Acad. nat. Sci. Philad.* **7:** 227–268.

Conrad, T. A. 1862. *Proc. Boston Soc. nat. Hist.* **8.**

Cossmann, M. 1921. Rectification du nomenclature. *Rev. crit. paléozool. Paris.* **25.** 79, 80 [pages as quoted in *Zool. Record*].

† Cox, L. R. 1927. Neogene and Quaternary Mollusca from the Zanzibar Protectorate. *In* Zanzibar Protectorate. *Report on the palaeontology of the Zanzibar Protectorate.* 13–103. London: H.M.S.O.

† Cox, L. R. 1929. Notes on the Post-Miocene Ostreidae and Pectinidae of the Red Sea region, with remarks on the geological significance of their distribution. *Proc. malac. Soc. Lond.* **18:** 165–209.

Cox, L. R. 1930a. *Comus,* a new genus of the Veneridae from South and East Africa. *Proc. malac. Soc. Lond.* **19:** 20–22.

† Cox, L. R. 1930b. On an abnormal *Navicula* from South Africa. *Proc. malac. Soc. Lond.* **19:** 154–155.

† Cox, L. R. 1939. Depósitos terciários e post-pliocenos do distrito de Inhambane. Estudo paleontológico . . . de moluscos. *Bol. Serv. Industr. Ser. Geol. Lourenço Marques* **3:** 65–103.

Crossland C. & Stephenson, T. A. 1948. Reef corals of the South African coast. *Ann. Natal Mus.* **11:** 169–205.

Dall, W. H. 1886. Reports on the results of dredging by the United States Coast Survey steamer *Blake.* xxix. Report on the Mollusca. Part 1. Brachiopoda and Pelecypoda. *Bull. Mus. comp. Zool. Harv.* **12:** 171–318.

Dall, W. H. 1901. Synopsis of the Lucinacea and of the American species. *Proc. U.S. nat. Mus.* **23:** 779–833.

Dall, W. H., Bartsch, P. & Rehder, H. A. 1938. A manual of the recent and fossil marine pelecypod mollusks of the Hawaiian Islands. *Bull. Bishop Mus., Honolulu* **153:** 1–233.

Dautzenberg, P. 1910. Contribution à la fauna malacologique de l'Afrique occidentale. *Act. Soc. linn. Bordeaux* **64:** 1–174.

Dautzenberg, P. 1912. Mollusques marins. Mission Gruvel sur la côte occidentale d'Afrique (1909–1910). *Ann. Inst. océanogr. Monaco* **5,** 3: 1–111.

Dautzenberg, P. 1927. Mollusques provenant des campagnes scientifiques du Prince Albert 1er de Monaco dans l'Océan Atlantique et dans de Golfe Gascogne. *Résult. Camp. sci. Monaco* **72:** 1–408.

Dautzenberg, P. 1929. Contribution à l'étude de la faune de Madagascar. Mollusca II. Mollusca marina testacea. *Faune Colon. franc.* **3:** 321–636.

Dautzenberg, P. & Bavay, A. 1912. Les lamellibranches de l'expédition du Siboga [II]. Partie systématique. 1: Pectinidés. *Siboga Exped.* monogr. **53^{b}:** 1–41.

Dautzenberg, P. & Fischer, H. 1897. Campagnes scientifiques de S.A. le Prince Albert 1er de Monaco. Dragages effectuées par l'*Hirondelle* et par la *Princesse Alice* 1888–1896. *Mém. Soc. zool. Fr.* **10:** 139–234.

Dautzenberg, P. & Fischer, H. 1912. Mollusques provenant des campagnes de l'*Hirondelle* et de la *Princesse Alice* dans les mers du Nord. *Res. Camp. sci. Monaco* **37:** 1–629.

Dautzenberg, P. & Fischer, H. 1914. Sur quelques types de Garidés de la collection de Lamarck existant au Museum. *J. Conchyliol.* **61:** 215–228.

Day, J. H. 1959. The biology of Langebaan Lagoon: a study of the effect of shelter from wave action. *Trans. roy. Soc. S. Afr.* **35:** 475–547.

Day, J. H., Millard, N. A. H. & Broekhuysen, G. J. 1954. The ecology of South African estuaries. 4. The St. Lucia system. *Trans. roy. Soc. S. Afr.* **34:** 129–156.

Day, J. H. Millard, N. A. H. & Harrison, A. D. 1952. The ecology of South African estuaries. 3. Knysna: a clear open estuary. *Trans. roy. Soc. S. Afr.* **33:** 367–413.

Day, J. H. & Morgans, J. F. C. 1956. The ecology of South African estuaries. 7. The biology of Durban Bay. *Ann. Natal Mus.* **13:** 259–312.

Deshayes, G. P. 1850. Mollusques. *In* Cuvier, *Le Règne Animal.* Atlas. Paris.

Deshayes, G. P. 1853–54. Catalogue of the Conchifera or bivalve shells in the British Museum. Part 1: 1–216; Part 2: 217–292. London: British Museum.

Deshayes, G. P. 1854. Observations sur les animaux de quelques genres de mollusques acéphales (*Chamostrea, Glauconome, Clementia, Circe, Capsa*). *Proc. zool. Soc. Lond.* **1853:** 167–173.

Deshayes, G. P. 1855. Descriptions of new shells from the collection of Hugh Cuming Esq. *Proc. zool. Soc. Lond.* **1854:** 317–371.

Deshayes, G. P. 1856a Sur le genre *Scintilla. Proc. zool. Lond.* **1855:** 171–181.

Deshayes, G. P. 1856b. Descriptions de nouvelles espèces du genre *Erycina. Proc. zool. Soc. Lond.* **1855:** 181–183.

Deshayes, G. P. 1863. Catalogue des mollusques de l'Île de la Réunion (Bourbon). *In* Maillard, L. *Notes sur l'Île de la Réunion* (*Bourbon*). 2nd ed. **2,** Annexe E. Paris.

Dillwyn, L. W. 1817. *A descriptive catalogue of recent shells.* 2 vols. London.

† Dollfus, G. F. 1911. Les coquilles du quaternaire marin du Sénégal. *Mém. Soc. géol. Fr.* **18,** *Mém.* **44:** 14–72.

Dunker, W. B. R. H. 1846. Diagnoses molluscorum novorum. *Z. Malakozool.* **3:** 108–112.

Dunker, W. B. R. H. 1864. Fünf neue Mollusken: ... *Tivela natalensis. Malakozool. Bl.* **11:** 99–102.

Dunker, W. B. R. H. 1871. Mollusca nova Musei Godeffroy Hamburgensis. *Malakozool. Bl.* **18:** 150–175.

† Eames, F. E. & Cox, L. R. 1956. Some Tertiary Pectinacea from East Africa, Persia and the Mediterranean Region. *Proc. malac. Soc. Lond.* **32:** 1–68.

† Etheridge, R. 1904. Cretaceous fossils of Natal, collected by Mr. William Anderson, Government Geologist. Part I. The Umkwelane Hill deposit. *Rep. geol. Surv. Natal Zululd.* **2:** 71–93.

Eyre, J. & Stephenson, T. A. 1938. The South African intertidal zone and its relation to the ocean currents. 5. A sub-tropical Indian Ocean shore. *Ann. Natal Mus.* **9:** 21–46.

Fischer, P. 1880–87. *Manuel de conchyliologie et de paléontologie conchyliologique.* Paris: Savy.

Fischer-Piette, E. 1939. Sur quelques espèces de *Sunetta* (Veneridae) et sur les divisions de ce genre. *Bull. Mus. Hist. nat., Paris* (2) **11:** 142–146.

Fleming, C. A. 1957. The genus *Pecten* in New Zealand. *Palaeont. Bul. N.Z.* **26:** 1–67.

Forbes, E. 1854. See: Woodward, S. P. 1851–1856.

Forskal, P. 1775. *Descriptiones animalium in itinere Orientalis observavit . . .* Hauniae.

Franca, M. L. *see* Paes-da Franca.

Fritsch, G. 1868. *Drei Jahre in Südafrika.* Breslau: Hirt.

† Gevers, T. W. 1932. The occurrences of salt in the Swakopmund area, South West Africa. *Trans. geol. Soc. S. Afr.* **34** (**1931**): 61–80.

Gmelin, J. F. 1790. *C.a.Linné. Systema Naturae.* Ed. 13. Lipsiae.

Gould, A. A. 1861. Descriptions of shells collected by the North Pacific Exploring Expedition. *Proc. Boston Soc. nat. Hist.* **8:** 14–40.

Grau, G. 1959. Pectinidae of the Eastern Pacific. *Allan Hancock Pacif. Exped.* **23:** 1–308.

Gravely, F. H. 1941. Shells and other animal remains found on the Madras beach. I. Groups other than snails etc. *Bull. Madras Govt. Mus.* n.s. Nat. Hist. **5,** 1: 1–112.

Gray, J. E. 1837. A synoptical catalogue of the species of certain tribes or genera of shells . . . in the British Museum. Fam. Mactradae. *Mag. nat. Hist.* n.s. **1:** 370–376.

Gray, J. E. 1838. Catalogue of the species of the genus *Cytherea* Lamarck, with description of some new genera and species. *Analyst* **8:** 302–309.

Gray, J. E. 1851. An attempt to arrange the species of the family Pholadidae into natural groups. *Ann. nat. Hist.* (2) **8:** 380–386.

Haas, F. 1936. Malakologische Bemerkungen und Neubeschreibungen. *Senckenbergiana* **18:** 143–154.

Hammersley-Heenan, R. H. 1889. A short account of the attacks of the *Teredo navalis,* and *Chelura terebrans* upon Greenheart (*Nectrandra rodioei*) and Sneezewood (*Pteroxylon utile*) timbers. *Trans. S. Afr. phil Soc.* **5:** 313–317.

Hanley, S. 1842–56. *An illustrated and descriptive catalogue of recent bivalve shells, forming an appendix to the Index Testaceologicus.* London.

Hanley, S. 1843. Five new species of *Donax. Proc. zool. Soc. Lond.* **1843:** 5–6.

Hanley, S. 1844. Descriptions of new species of Mytilacea etc. *Proc. zool. Soc. Lond.* **1844:** 14–18.

Hanley, S. 1846. A monograph of the genus *Tellina. In* Sowerby, G. B. *Thesaurus conchyliorum.* **1:** 221–336. London: Sowerby.

Hanley, S. 1857. Descriptions of four new species of Kelliadae in the collection of Hugh Cuming Esq. *Proc. zool. Soc. Lond.* **1856:** 340–341.

Hanley, S. 1858. Description of new Pinnae. *Proc. zool. Soc. Lond.* **1858:** 225–229.

Hanley, S. 1882. On the genus *Leptomya* (A. Adams). *Proc. zool. Soc. Lond.* **1882:** 576–577.

Hanley, S. 1883. Description of new species of *Donax* in the collection of the author. *J. Linn. Soc.* (*Zool.*) **16:** 539–541.

† Haughton, S. H. 1932. The Late Tertiary and Recent deposits of the west coast of South Africa. *Trans. geol. Soc. S. Afr.* **34:** 19–57.

† Haughton, S. H. 1956. Glauconitic-phosphatic deposits off the west coast of South Africa. *Ann. S. Afr. Mus.* **42:** 329–334.

Hedley, C. 1911. Report on the Mollusca obtained by the F.I.S. 'Endeavour', chiefly off Cape Wiles, South Australia. Part 1. *Zool. Res. Fish. Exp. 'Endeavour'.* **1:** 89–114.

Hedley, C. 1921. A revision of the Australian *Tridacna. Rec. Aust. Mus.* **13:** 63–172.

Hedley, C. 1924. A revision of the Australian Pinnidae. *Rec. Aust. Mus.* **14:** 141–153.

Heppell, D. 1963. Notes on the Pholadidae, with a key to the British species. *Conch. News Lett., Lond.* **1,** 7: 33–35.

Herdman, W. A. 1906. *Reports to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar.* Part 5, General Summary: 109–136. London: Royal Society.

Hinds, R. B. 1843. Descriptions of new species of shells collected by Sir Edward Belcher. *Proc. zool. Soc. Lond.* **1843:** 55–59.

Hinds, R. B. 1844. *The zoology of the voyage of H.M.S.* Sulphur, *under the command of Captain Sir Edward Belcher, R.N., C.B., F.R.G.S., etc., during the years* 1836–42. **2.** Mollusca: 1–72. London: Smith, Elder.

Holme, N. A. 1959. The British species of *Lutraria,* with a description of *L. angustior* Philippi. *J. mar. biol. Ass. U.K.* **38:** 557–568.

Iredale, T. 1927. Caloundra shells. *Aust. Zool.* **4:** 331–336.

Iredale, T. 1939. Mollusca. Part 1. *Sci. Rep. Gr. Barrier Reef Exped.* **5:** 209–425.

Issel, A. 1869. *Malacologia del Mar Rosso.* Pisa.

Jaeckel, S. *see* Thiele, J. & Jaeckel, S.

Jameson, H. L. 1901. On the identity and distribution of the mother-of-pearl oysters, with a revision of the subgenus *Margaritifera. Proc. zool. Soc. Lond.* **1901:** 372–394.

JEFFREYS, J. G. 1879. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868–70. Part 2. *Proc. zool. Soc. Lond.* **1879:** 553–588.

JEFFREYS, J. G. 1881. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868–70. Part 4. *Proc. zool. Soc. Lond.* **1881:** 922–952.

† JOHNSON, J. P. 1904. Notes on sections at Shark River and The Creek, Algoa Bay. *Trans. geol. Soc. S. Afr.* **6:** 9–11.

JOUSSEAUME, F. 1891. Diagnoses de mollusques nouveaux. *Naturaliste* **13:** 222.

JUKES-BROWNE, A. J. 1905. A review of the genera of the family Mytilidae. *Proc. malac. Soc. Lond.* **6:** 211–224.

JUKES-BROWNE, A. J. 1915. [Letter re Veneridae.] *J. Conch.* **14:** 284.

KALK, M. 1958. Ecological studies on the shores of Moçambique. 1. The fauna of intertidal rocks at Inhaca Island, Delagoa Bay. *Ann. Natal Mus.* **14:** 189–242.

KIRA, T. 1955. *Coloured illustrations of the shells of Japan.* Osaka: Hoikusha.

KOCH, H. J. 1953. A new species of the lamellibranch genus *Isognomon* from South Africa. *Proc. malac. Soc. Lond.* **30:** 22.

KORRINGA, P. 1956. Oyster culture in South Africa. Hydrographical, biological and ostreological observations in the Knysna lagoon, with notes on conditions in other South African waters. *Invest. Rep. Div. Fish. S. Afr.* **20:** 1–86.

KRAUSS, F. 1848. *Die südafrikanischen Mollusken. Ein Beitrag zur Kenntniss der Mollusken des Kap- und Natallandes und zur geographischen Verbreitung derselben, mit Beschreibung und Abbildung der neuen Arten.* Stuttgart: Ebner & Seubert.

KRAUSS, F. 1852. Neue Kap'sche Mollusken, als Zusatz zu meiner Schrift: 'Die Südafrikanischen Mollusken'. *Arch. Naturgesch.* **18,** 1: 29–40.

† KRIGE, A. V. 1927. An examination of the Tertiary and Quaternary changes in sea-level in South Africa, with special stress on the evidence of a recent world-wide sinking of sea-level. *Ann. Univ. Stellenbosch* **5,** A, 1: 1–81.

† KRIGE, L. 1933. The geology of Durban. *Trans. geol. Soc. S. Afr.* **35:** 37–67.

KÜHNELT, W. 1956. Lebensformen und Entwicklungsrichtungen der Muscheln. *Verh. zool. bot. Ges. Wien.* **96:** 16–41.

LAMARCK, J. P. B. 1804. Sur une nouvelle espèce de Trigonie (*T. margaritacea*), et sur une nouvelle espèce d'huitre (*Ostrea tuberculata*), découvertes dans le voyage du Capitaine Baudin. *Ann. Mus. Hist. nat., Paris* **4:** 351–359.

LAMARCK, J. P. B. 1818–19. *Histoire naturelle des animaux sans vertèbres.* **5–7.** Paris.

LAMY, E. 1907. Révision des *Arca* vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **55:** 1–111, 199–307.

LAMY, E. 1912. Révision des *Limopsis* vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **60:** 108–137.

LAMY, E. 1913–14. Révision des Scrobiculariidae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **61:** 243–368.

LAMY, E. 1915. Notes sur les espèces Lamarckiennes appartenant au genre *Lucina* Bruguière 1797. *Bull. Mus. Hist. nat., Paris* **21:** 154–160.

LAMY, E. 1917. Révision des Crassatellidae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **62:** 197–270.

LAMY, E. 1917/18. Révisions des Mactridae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **63:** 173–275 (1917), 291–411 (1918).

LAMY, E. 1918. Notes sur les espèces du genre *Plicatula* décrites par Lamarck. *Bull. Mus. Hist. nat., Paris* **1918:** 510–513.

LAMY, E. 1919. Les lithodomes de la Mer Rouge. *Bull. Mus. Hist. nat., Paris.* **1919:** 252–257, 344–350.

LAMY, E. 1920a. Révision des Lucinacea vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **65:** 71–122, 169–222.

LAMY, E. 1920b. Description d'un lamellibranche nouveau du Natal. *Bull. Soc. zool. Fr.* **45:** 152–154.

LAMY, E. 1924/25. Révision des Saxicavidae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **68:** 218–248 (1924), 261–283 (1925).

LAMY, E. 1925. Révision des Gastrochaenidae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **68:** 284–319.

LAMY, E. 1929. Révision des *Ostrea* vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **73:** 1–46, 71–108.

Lamy, E. 1931. Voyage de Mons. P. Lesne dans l'Afrique du Sud, 1928–1929. Mollusques marins. *Bull. Mus. Hist. nat., Paris.* (2) **3:** 304–307.

Lamy, E. 1936/37. Révision des Mytilidae vivants du Muséum d'Histoire Naturelle de Paris. *J. Conchyliol.* **80:** 66–102, 107–212, 229–295 (1936); 307–363; **81:** 5–71, 99–132, 169–197 (1937).

Lamy, E. & Fischer-Piette, E. 1939. Notes sur les espèces Lamarckiennes d'*Amygdala* et de *Pullastra*. *Bull. Mus. Hist. nat., Paris* (2) **11:** 461–466.

Leach, W. E. 1814–17. *The zoölogical miscellany*. 3 vols. London.

Lebour, M. V. 1938. Notes on the breeding of some lamellibranchs from Plymouth and their larvae. *J. mar. biol. Ass. U.K.* **23:** 119–144.

Lischke, C. E. 1869–74. Japanische Meeresconchylien. Cassel.

List, T. 1902. Die Mytiliden des Golfes von Neapel. *Fauna u. Flora Neapel.* **27:** i–x, 1–312.

Lynge, H. 1909. The Danish Expedition to Siam 1899–1900. IV. Marine Lamellibranchiata. *K. danske vidensk. Selsk. Skr.* (7) **5:** 99–299.

Macnae W. & Kalk, M. 1958. *A natural history of Inhaca Island*. Johannesburg: Witwatersrand university press.

Melvill, J. C. 1898. A brief bibliographic résumé of the Erythraean mollusc fauna, with descriptions of sixteen species from Aden. *Ann. Mag. nat. Hist.* (7) **1:** 194–206.

Melvill, J. C. 1899. Notes on the Mollusca of the Arabian Sea, Persian Gulf, and Gulf of Oman, mostly dredged by Mr. F. W. Townsend, with descriptions of twenty-seven species. *Ann. Mag. nat. Hist.* (7) **4:** 81–101.

Melvill, J. C. & Standen, R. 1899. Report on the marine Mollusca obtained during the first expedition of Prof. A. C. Haddon to the Torres Straits in 1888–89. *J. Linn. Soc.* (*Zool.*) **27:** 150–206.

Melvill, J. C. & Standen, R. 1906. The Mollusca of the Persian Gulf, Gulf of Oman, and Arabian Sea, as evidenced mainly through the collections of Mr. F. W. Townsend 1893–1906; with descriptions of new species. *Proc. zool. Soc. Lond.* **1906:** 783–848.

Melvill, J. C. & Standen, R. 1907 (issued separately). The marine Mollusca of the Scottish National Antarctic Expedition. *Trans. roy. Soc. Edinb.* **46,** 1908: 119–157.

Melvill, J. C. & Sykes, E. R. 1898. Notes on a second collection of marine shells from the Andaman Islands, with descriptions of new forms of *Terebra*. *Proc. malac. Soc. Lond.* **3:** 35–48.

Ménard de la Groye, F. J. B. 1807. Sur un nouveau genre de coquille de la famille de Solénoides (Panopea). *Ann. Mus. Hist. nat., Paris* **9:** 131–139.

Moll, F. & Roch, F. 1931. The Teredinidae of the British Museum and the Jeffreys Collection. *Proc. malac. Soc. Lond.* **19:** 201–218.

Moll, F. & Roch, F. 1937. Die geographische Verbreitung der Terediniden Afrikas. *Mitt. zool. Mus. Berl.* **22:** 161–189.

Montagu, G. 1803–8. *Testacea Brittanica*. 2 vols. & suppl. London.

Muir, J. 1937. The seed-drift of South Africa and some influences of ocean currents on the strand vegetation *Mem. bot. Surv. S. Afr.* **16:** 1–108.

Nagabhushanam, R. 1958. A systematic account of the molluscan woodborers of Visakhapatnam harbour. *Rec. Indian Mus.* **53:** 1–12.

Nair, N. B. 1956. Shipworms from India. Report on ten species of shipworms from the Madras coast. *Rec. Indian. Mus.* **52:** 387–414.

† Nardini, S. 1937. Molluschi delle spiagge emerse del Mar Rosso e dell'Oceano Indiano. Part 2. (Lamellibranchi.) *Palaeontogr. ital.* **37:** 225–278.

Nevill, G. & Nevill, H. 1871. Descriptions of new Mollusca from the Eastern regions. *J. Asiat. Soc. Beng.* **39** [*Zoological Record*], **40** [Royal Society's *Catalogue* . . .], 2: 1–11.

† Newton, R. Bullen. 1913. On some Kainozoic shells from South Africa. *Rec. Albany Mus.* **2:** 315–352.

Nicklès, M. 1950. *Mollusques testacés marins de la côte occidentale d'Afrique*. Paris: Lechevalier.

Nicklès, M. 1955. Scaphopodes et lamellibranches récoltés dans l'Ouest africain. *Atlantide Rep.* **3:** 93–237.

Odhner, N. H. 1917. Results of Dr. E. Mjöberg's Swedish scientific expeditions to Australia 1910–13. *K. svenska VetenskAkad. Handl.* **52:** 1–115.

Odhner, N. H. 1919. Contribution à la faune malacologique de Madagascar. *Ark. Zool.* **12,** 6: 1–52.

79

Odhner, N. H. 1923. Contribution to the marine molluscan faunas of South and West Africa. *Göteborgs VetenskSamh. Handl.* (4) **26,** 7: 1–39.

Orton, J. H. 1928. The dominant species of *Ostrea*. *Nature, Lond.* **121:** 320–321.

Paes-da Franca, M. de L. 1957. Contribuicão para o conhecimento da fauna malacológica de Angola. Moluscos bivalves. *An. Jta Invest. Ultramar* **10** (1955): 1–20.

Paes-da Franca, M. de L. 1960. Sobre uma colecção malacolʙgica recolhida na Ihla da Inhaca (Moçambique). *Mem. Jta Invest. Ultramar* **15:** 43–102.

Pallary, P. *et al.* 1926. Explication des planches de J. C. Savigny. *Mém. Inst. égypt.* (*Egypte*) **11:** 1–138.

Pelseneer, P. 1911. Les lamellibranches de l'expedition du Siboga. [1]. Partie anatomique. *Siboga Exp.* monogr. **53^{a}:** 1–125.

Pennant, T. 1776–77. *British zoology*. Ed. 4. 4 vols. Warrington & London.

Philippi, R. A. 1843–49. *Abbildungen und Beschreibungen neuer oder wenig bekannter Conchylien* . . . 1–3. Cassel.

Philippi, R. A. 1844. *Enumeratio molluscorum Siciliae*. **2**. Berolini.

Philippi, R. A. 1847. Testaceorum novorum centuria. *Z. Malakozool.* **4:** 71–77, 84–96, 113–127.

Philippi, R. A. 1848–1849. Centuria tertia Testaceorum novorum. *Z. Malakozool.* **5** (1848): 151–176, 186–192. **6** (1849): 17–26.

Pilsbry, H. A. 1901a. New species of mollusks from South Africa and Burma. *Proc. Acad. nat. Sci. Philad.* **53:** 188–190.

Pilsbry, H. A. 1901b. New Japanese marine, land and fresh-water Mollusca. *Proc. Acad. nat. Sci. Philad.* **53:** 385–408.

Prashad, B. 1932. The Lamellibranchia of the Siboga Expedition. [III]. Systematic part 2. Pelecypoda (exclusive of the Pectinidae). *Siboga Exped.* monogr. **53^{c}:** 1–354.

Ranson, G. 1941. Les espèces actuelles et fossiles du genre *Pycnodonta*. I. *Pycnodonta hyotis* (L.). *Bull. Mus. Hist. nat., Paris* (2) **13:** 82–92.

Ranson, G. 1949. Note sur la répartition géographique des Ostréidés du genre *Pycnodonta*. *Bull. Mus. Hist. nat., Paris* (2) **21:** 447–452.

Ranson, G. 1951. Observations morphologiques, biologiques, biogéographiques, géologiques et systématiques sur une espèce d'huitre de Madagascar et d'Afrique du Sud. *Bull. Inst. océanogr. Monaco* **983:** 1–20.

Reeve, L. A. 1843–78. *Conchologica iconica*. London.

Reinhart, P. W. 1935. Classification of the pelecypod family Arcidae. *Bull. Mus. Hist. nat. Belg.* **11,** 13: 1–68.

Roch, F. 1931. Die Teredinidae der skaninavischen Museums Sammlungen. *Ark. Zool.* **22** A 13: 1–29.

Roch, F. 1955. Die Terediniden Ost- und Westindiens der Holländischen Museums-Sammlungen zu Amsterdam und Leiden. *Zoöl. Meded.* **34:** 125–151.

Roch, F. & Moll, F. 1929. Die Terediniden der zoologischen Museen zu Berlin und Hamburg. *Mitt. zool. Mus. Hamb.* **44** (1931): 1–22.

Röding, P. F. 1798. *Museum Boltenianum sive Catalogus Cimeliorum . . . collegerat Joa. Fried. Bolten*. Hamburg.

Rosewater, J. 1961. The family Pinnidae in the Indo-Pacific. *Indo-Pacif. Mollusca* **1,** 4: 175–226.

Roughley, T. C. 1926. An investigation of the cause of an oyster mortality on the George's River, New South Wales, 1924–25. *Proc. Linn. Soc. N.S.W.* **51:** 446–491.

Sars, G. O. 1878. *Mollusca regionis Arcticae Norvegiae*. Christiania: Brφgger.

Say, T. 1821–22. An account of some of the marine shells of the United States. *Amer. J. Sci.* **2:** 221–248, 257–276, 302–325. (*J. Acad. nat. Sci. Philad.*)

† Scacchi, A. 1834–36. *Notizie intorno alle Conchiglie . . . fossili che si trovano . . . di Gravini in Puglia*. Napoli. (*Ann. Civ. Reg. due Sicilie* **6,** 7.)

Schepman, M. M. & Nierstrasz, H. F. 1914. Parasitische und kommensalistische Mollusken aus Holothurien. *In* Voeltzkow, A. *Reise in Ostafrika*. **4,** 4: 383–416. Stuttgart.

† Schwarz, E. H. L. 1900. Knysna between the Gouwkamma and the Blue Krantz River. *Rep. geol. Comm. C.G.H.* for **1899:** 51–63.

† Schwarz, E. H. L. 1910. The Pleistocene deposits of Port Elizabeth. *Trans. geol. Soc. S. Afr.* **12:** 112–118.

Scott, K. M. F., Harrison, A. D. & Macnae, W. 1952. The ecology of South African estuaries. 2. The Klein River estuary, Hermanus, Cape. *Trans. roy. Soc. S. Afr.* **33:** 283–331.

Seurat, L. G. 1904. Sur le rôle des algües vertes dans l'évolution des jeunes *Margaritifera. Bull. Mus. Hist. nat., Paris* **10:** 359–363.

Sivickis, P. B. 1928. New Philippine shipworms. *Philipp. J. Sci.* **37:** 285–298.

Smith, E. A. 1877. On the shells of Lake Nyassa, and on a few marine species from Mozambique. *Proc. zool. Soc. Lond.* **1877:** 712–722.

Smith, E. A. 1880. On the genus *Myodora* Gray. *Proc. zool. Soc. Lond.* **1880:** 578–587.

Smith, E. A. 1885. Report on the Lamellibranchiata collected by H.M.S. *Challenger* during the years 1873–76. *Rep. Voy. Challenger* 1873–76 **13:** 1–341.

Smith, E. A. 1891. On a collection of marine shells from Aden, with some remarks upon the relationship of the molluscan fauna of the Red Sea and the Mediterranean. *Proc. zool. Soc. Lond.* **1891:** 390–436.

Smith, E. A. 1895. Natural history notes from H.M. Indian Marine Survey steamer 'Investigator' . . . Series II, no. 19. Report upon the Mollusca dredged in the Bay of Bengal and the Arabian Sea during 1893–94. *Ann. Mag. nat. Hist.* (6) **16:** 1–19.

Smith, E. A. 1896. Natural history notes from H.M. Indian Marine Survey steamer 'Investigator' . . . Series II, no. 22. Descriptions of new deep-sea Mollusca. *Ann. Mag. nat. Hist.* (6) **18:** 367–375.

Smith, E. A. 1897–1909. *Illustrations of the Zoology of the Royal Indian Marine Surveying Steamer* Investigator . . . Mollusca. Plates 1–23. Calcutta.

Smith, E. A. 1899. Descriptions of new species of South African marine shells. *J. Conch.* **9:** 247–252.

Smith, E. A. 1901. On South African marine shells with descriptions of new species. *J. Conch.* **10:** 104–116.

Smith, E. A. 1903a (Oct.). A list of species of Mollusca from South Africa, forming an appendix to G. B. Sowerby's 'Marine shells of South Africa'. *Proc. malac. Soc. London.* **5:** 354–402.

Smith, E. A. 1903b (Nov.). Marine Mollusca. *In* Gardiner, J. S. *ed. The fauna and geography of the Maldive and Laccadive Archipelagoes.* **2:** 589–630. Cambridge: University press.

Smith, E. A. 1904a. On a collection of marine shells from Port Alfred, Cape Colony. *J. Malacol.* **11:** 21–44.

Smith, E. A. 1904b. Natural history notes from H.M. Indian Marine Survey steamer 'Investigator'. Series III, No. 1. On Mollusca from the Bay of Bengal and the Arabian Sea. *Ann. Mag. nat. Hist.* (7) **14:** 1–14.

Smith, E. A. 1906a. Natural history notes from H.M. Indian Marine Survey steamer 'Investigator'. Series III, No. 10. On Mollusca from the Bay of Bengal and the Arabian Sea. *Ann. Mag. nat. Hist.* (7) **18:** 245–264.

Smith, E. A. 1906b. On South African marine Mollusca with descriptions of new species. *Ann. Natal Mus.* **1:** 19–71.

† Smith, E. A. 1906c. *In* Rogers, A. W. A raised beach deposit near Klein Brak River. *Rep. geol. Comm. C.G.H.* **10:** 293–295.

Smith, E. A. 1910. On South African marine Mollusca, with descriptions of new species. *Ann. Natal Mus.* **2:** 175–220.

Smith, E. A. 1911. On the recent species of the genus *Vulsella. Proc. malac. Soc. Lond.* **9:** 306–312.

Smith, E. A. 1914. Descriptions of some South African marine shells. *Ann. Natal Mus.* **3:** 1–6.

Smith, E. A. & Bloomer, H. H. 1906. The marine fauna of Zanzibar and British East Africa, from collections made by Cyril Crossland, in the years 1901 and 1902. On some species of Solenidae. *Proc. zool. Soc. Lond* **1906:** 855–857.

Soot-Ryen, T. 1955. A report on the family Mytilidae (Pelecypoda). *Allan Hancock Pacif. Exped.* **20:** 1–174.

Soot-Ryen, T. 1958. A new genus of Mytilidae from South Africa. *Ann. Natal Mus* **14:** 341–344.

Soot-Ryen, T. 1963. Some nomenclatural changes in the family Mytilidae. *Proc. malac. Soc. Lond.* **35:** 127–128.

Sowerby, G. B. 1835. [Descriptions of shells from the Cuming collection.] *Proc. zool. Soc. Lond.* **3** (**1835**): 84–85.

Sowerby, G. B. 1841. On some new species of the genus *Cardium*, chiefly from the collection of H. Cuming Esq. *Proc. zool. Soc. Lond.* **8** (**1840**): 105–111.

Sowerby, G. B. 1842–66. *Thesaurus conchyliorum, or Monographs of genera of shells.* **1–3.** London: Sowerby.

Sowerby, G. B. 1870. Descriptions of forty-eight new species of shells. *Proc. zool. Soc. Lond.* **1870:** 249–259.

Sowerby, G. B. 1889a. Some further notes on marine shells collected at Port Elizabeth, South Africa, with descriptions of some new species. *J. Conch.* **6:** 6–15.

Sowerby, G. B. 1889b. Some further notes on marine shells from South Africa, with descriptions of new species. *J. Conch.* **6:** 147–159.

Sowerby, G. B. 1892. *Marine shells of South Africa. A catalogue of all the marine species with references to figures in various works, descriptions of new species, and figures of such as are new, little known, or hitherto unfigured.* London: Sowerby.

Sowerby, G. B. 1894. Marine shells of South Africa. *J. Conch.* **7:** 368–378.

Sowerby, G. B. 1897. *Appendix to Marine Shells of South Africa.* London.

Sowerby, G. B. 1902. Mollusca of South Africa. *Mar. Invest. S. Afr.* **2:** 93–100.

Sowerby, G. B. 1904. Mollusca of South Africa (Pelecypoda). *Mar. Invest. S. Afr.* **4:** 1–19.

Spärk, R. 1931. *Cycladoconcha amboinensis* n. gen. n.sp., a commensalistic lamellibranch. *Vidensk. Medd. dansk naturh. Foren. Kbh.* **91:** 227–240.

Spengler, L. 1797/8. Over det toskallede slaegt Tellinerne. *Skr. Nat. Selsk. Copenhagen* **4:** 67–127.

Stephenson, T. A. 1948. The constitution of the intertidal fauna and flora of South Africa. Part 3. *Ann. Natal Mus.* **11:** 207–324. (Reprints dated 1947.)

Stephenson, T. A., Stephenson, A. & Bright, K. M. F. 1938. The South African intertidal zone and its relation to ocean currents. 5. The Port Elizabeth district. *Ann. Natal Mus.* **9:** 1–19.

Stephenson, T. A., Stephenson, A. & du Toit, C. A. 1937. The South African intertidal zone and its relation to ocean currents. 1. A temperate Indian Ocean shore. *Trans. roy. Soc. S. Afr.* **24:** 341–382.

† Stow, G. W. 1871. On some points of South African geology. Part 1. § 2. Tertiary or Post-tertiary strata. *Quart. J. geol. Soc. Lond.* **27:** 515–522.

Swart, D. B. 1926. Note on the South African marine mussel *Mytilus meridionalis* Krauss (1848). *Trans. roy. Soc. S. Afr.* **13:** 275–290.

Thiele, J. 1910. Polyplacophora, Gastropoda marina, Bivalvia. *In* Schultze, L. *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Süd-Afrika.* **4:** 269–270. Jena: Fischer. *Denkschr. med.-naturw. Ges. Jena* **16:** 269–270.

Thiele, J. 1912. Die antarktischen Schnecken und Muscheln. *Dtsch. SüdpolExped.* **13:** 183–285.

Thiele, J. 1918–20. Familia Limidae. *In* Martini-Chemnitz. *Neues systematisches Conchylien-cabinet.* **7,** Abt. 2a: 1–66. [*See* Prashad, 1932: 4; Iredale, 1939: 382, footnote.]

Thiele, J. 1923. Ueber die Gattung *Philobrya* und das sogenannte Buccanervensystem von Muscheln. *Zool. Anz.* **55:** 287–292.

Thiele, J. 1934. *Handbuch der systematischen Weichtierkunde.* **2,** Bivalves: 782–948. Jena: Fischer.

[Note. Vol. 2 contains: Part 3. Scaphopoda, Bivalvia, Cephalopoda, Corrigenda to Parts 1 and 2, and Index to Part 3. Pp. 779–1022. Published 1934.

Also Part 4. Comparative Anatomy, Phylogeny, Geographical Distribution. pp. 1023–1154. Published 1935.

The title page to vol. 2 gave date 1935 only.

The *Zoological Record* did not record the publication of Part 4 in 1935.]

Thiele, J. & Jaeckel, S. 1931. Muscheln der Deutschen Tiefsee Expedition. *Wiss. Ergebn. 'Valdivia'* **21:** 161–268.

Thompson, J. M. 1954. The genera of oysters and the Australian species. *Aust. J. Mar. Freshw. Res.* **5:** 132–168.

Tomlin, J. R. le B. 1921. Six new marine shells from South Africa. *J. Conch.* **16:** 215–217.

Tomlin, J. R. le B. 1923. On South African marine Mollusca, with descriptions of several new species. *J. Conch.* **17:** 40–52.

Tomlin, J. R. le B. 1924a. *Venus latilirata* Sowerby. *J. Conch.* **17:** 114.

Tomlin, J. R. le B. 1924b. Notes on some Mactridae. *J. Conch.* **17:** 134–136. [Dates and authorship of species described by Reeve and Deshayes.]

Tomlin, J. R. le B. 1926. On South African marine Mollusca, with descriptions of new species. *Ann. Natal Mus.* **5:** 283–301.

Tomlin, J. R. le B. 1927. Report on the Mollusca. Cambridge Expedition to the Gulf of Suez 1924. *Trans. zool. Soc. Lond.* **22:** 291–320.

Tomlin, J. R. le B. 1930. New name for *Crassatella capensis* Odhner. *J. Conch.* **19:** 35.

Tomlin, J. R. le B. 1931. On South African marine Mollusca, with descriptions of new genera and species. *Ann. Natal Mus.* **6:** 415–450.

Tomlin, J. R. le B. 1937. Reports on the marine Mollusca in the collections of the South African Museum. X. Family Verticordiidae. *Ann. S. Afr. Mus.* **32:** 23–24.

Turner, R. D. & Boss, K. J. 1962. The genus *Lithophaga* in the western Atlantic. *Johnsonia* monogr. no. **41.**

Turton, W. 1822. *Conchylia Insularum Britannicarum.* Exeter.

Turton, W. H. 1932. *The marine shells of Port Alfred, S. Africa.* Oxford: Oxford university press.

Turton, W. H. 1933. 'The marine shells of Port Alfred, S. Africa'. [Corrigenda.] *J. Conch.* **19:** 370–371.

Valenciennes, A. 1839. Description de l'animal de la Panopée australe, et recherches sur les autres espèces vivantes ou fossiles de ce genre. *Arch. Mus. Hist. nat., Paris* **1:** 1–38.

Vanatta, E. G. 1901. New marine mollusks. *Proc. Acad. nat. Sci. Philad.* **53:** 182–187.

Van Bruggen, A. C. 1952. Notes on South African marine Mollusca. 1. *Philobrya angulata* (Sow.), an interesting species of the family Limopsidae. 2. A collection from Jeffreys Bay. *Basteria* **16:** 6–24.

Van Bruggen, A. C. 1954. Notes on South African marine Mollusca. 3. Some remarks on species of *Sunetta* and *Donax. Basteria* **18:** 49–53.

Van Bruggen, A. C. 1961. Notes on South African marine Mollusca. 4. A new variety of *Pecten sulcicostatus. Basteria* **25:** 31–32.

† Van Hoepen, E. C. N. 1940. Oor nuwe skulpe uit ou strandwalle en oor die ouderdom van die afsetting. *Tydskr. Wet. Kuns* **1:** 183–193.

Van Hoepen, E. C. N. 1941. Suid-Afrikaanse boormossels. *Tydskr. Wet. Kuns* **2:** 167–178.

Verrill, A. E. 1882. Catalogue of marine Mollusca added to the fauna of the New England region during the past ten years. *Trans. Conn. Acad. Arts Sci.* **5:** 447–587.

Verrill, A. E. 1884. Second catalogue of Mollusca recently added to the fauna of the New England coast and the adjacent parts of the Atlantic, consisting mostly of deep-sea species, with notes on others previously recorded. *Trans. Conn. Acad. Arts Sci.* **6:** 139–294.

Verrill, A. E. 1885. Third catalogue of Mollusca . . . *Trans. Conn. Acad. Arts Sci.* **6:** 395–452.

Verrill, A. E. 1897. A study of the family Pectinidae, with a revision of the genera and subgenera. *Trans. Conn. Acad. Arts Sci.* **10:** 41–96. [Front and back covers dated 1899, but at foot of folio p. 49 dated 1897; entered in *Zoological Record* for 1897.]

† Von Hochstetter, F. C. 1866. *Reise der Oestereichischen Fregatte* Novara *um die Erde . . .* Geologischer Theil. **2.** Wien.

Von Martens, E. 1874. Ueber einige Südafrikanischen Mollusken. Nach der Sammlung von Dr. G. Fritsch. *Jb. Dtsch. malakozool. Ges.* **1:** 119–146.

Von Martens, E. 1879. Uebersicht der von W. Peters in Mossambique gesammelten Mollusken. *Mber. preuss. Akad. Wiss. Berl.* **1879:** 727–749.

Von Martens, E. 1880. Mollusken. *In* Möbius, K. *Beiträge zur Meeresfauna der Insel Mauritius unp der Seychellen.* 181–352. Berlin.

Von Martens, E. 1897. Süss- und Brackwasser Mollusken des Indischen Archipels. *In* Weber, M. *Zoologische Ergebnisse einer Reise in Niederländisch Ost Indien.* **4:** 1–331. Leiden.

Watson, H. 1930a. On the anatomy and affinities of *Plicatula. Proc. malac. Soc. Lond.* **19:** 25–31.

Watson, H. 1930b. On the central nervous system of *Spondylus*, and what happens to a headless mollusc's brain. *Proc. malac. Soc. Lond.* **19:** 31–36.

Wilkins, G. L. 1953. Notes from the British Museum. I. *Pinna. Proc. malac. Soc. Lond.* **30:** 23–29.

Winckworth, H. C. & Winckworth, R. 1935. *Eastonia rugosa* and other Portuguese Mollusca. *J. Conch.* **20:** 162–163.

Winckworth, R. 1922. Note on the British species of *Anomia. Proc. malac. Soc. Lond.* **15:** 32–34.

Winckworth, R. 1929. Marine Mollusca from South India and Ceylon. III. *Pinna*, with an index to the recent species of *Pinna. Proc. malac. Soc. Lond.* **18:** 276–297.

Winckworth, R. 1936. Marine Mollusca from South India and Ceylon. X. Further notes on *Pinna. Proc. malac. Soc. Lond.* **22:** 20–23.

Wood, W. 1828. *Index testaceologicus. Supplement.* London.

Woodward, M. F. 1893. On the anatomy of *Ephippodonta macdoughalli* Tate. *Proc. malac. Soc. Lond.* **1:** 20–26.

Woodward, S. P. 1851–1856. *A manual of the Mollusca.* London.

Woodward, S. P. 1856. On *Panopaea Aldrovandi* Lam. *Proc. zool. Soc. Lond.* **23** (1855): 218–221.

WRIGHT, E. P. 1866. Contributions to a natural history of the Teredidae. *Trans. Linn. Soc. Lond.* **25**: 561–568.

† WYBERGH, W. 1920. The coastal limestones of the Cape Province. *Trans. geol. Soc. S. Afr.* **22** (1919): 46–67.

ZOOLOGICAL SOCIETY OF LONDON. 1893. List of the dates . . . of the 'Proceedings' of the Zoological Society of London, from the commencement in 1830 to 1859 inclusive. *Proc. zool. Soc. Lond.* **1893**: 436–440.